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OCTOBER • 1939

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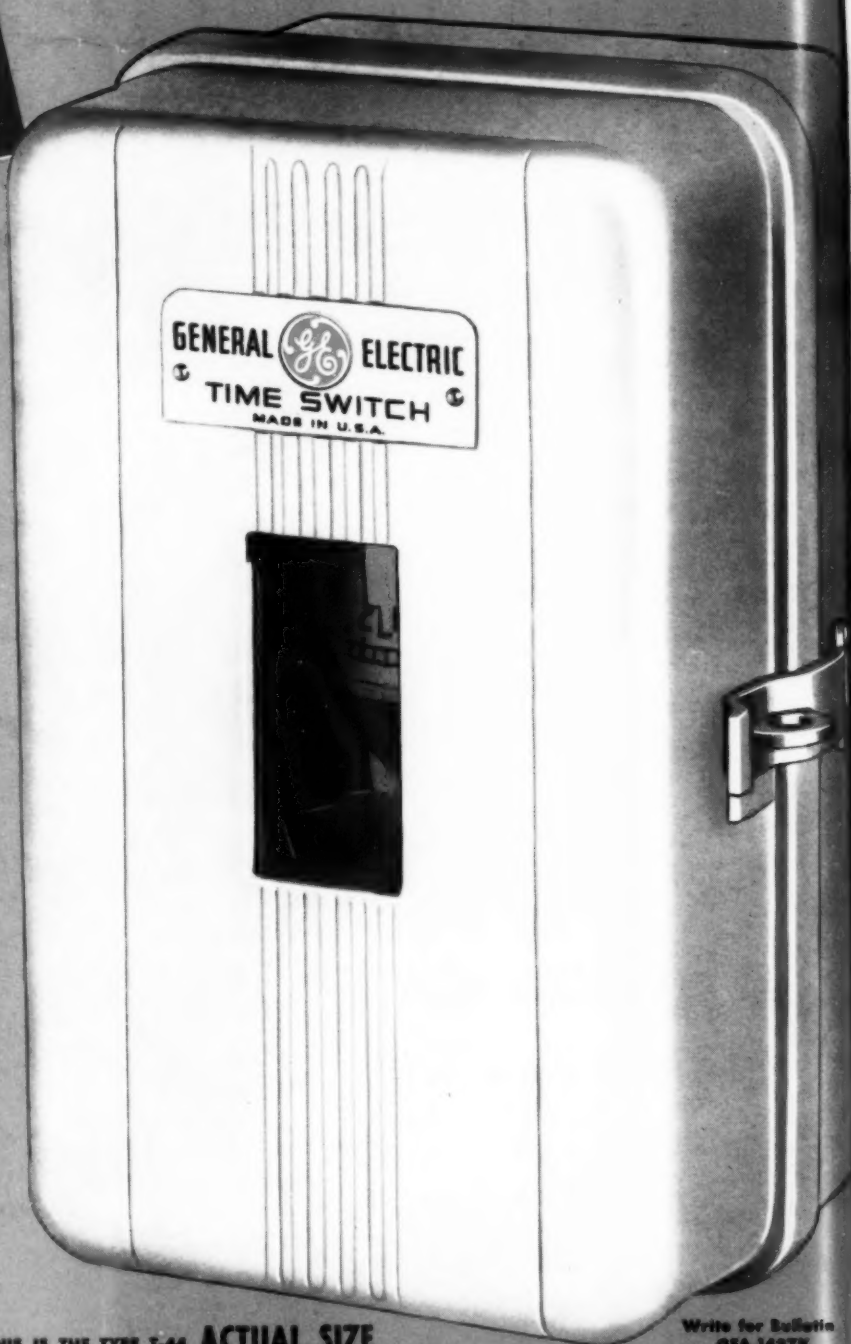
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You can now get all these advantages that make for more profitable, more reliable installations in one general-purpose time switch — General Electric's new Type T-44. Ask your nearest G-E office for the complete descriptive bulletin on this new switch — our publication GEA-1427K. Or write General Electric, Schenectady, New York.



THIS IS THE TYPE T-44 ACTUAL SIZE

Write for Bulletin
GEA-1427K

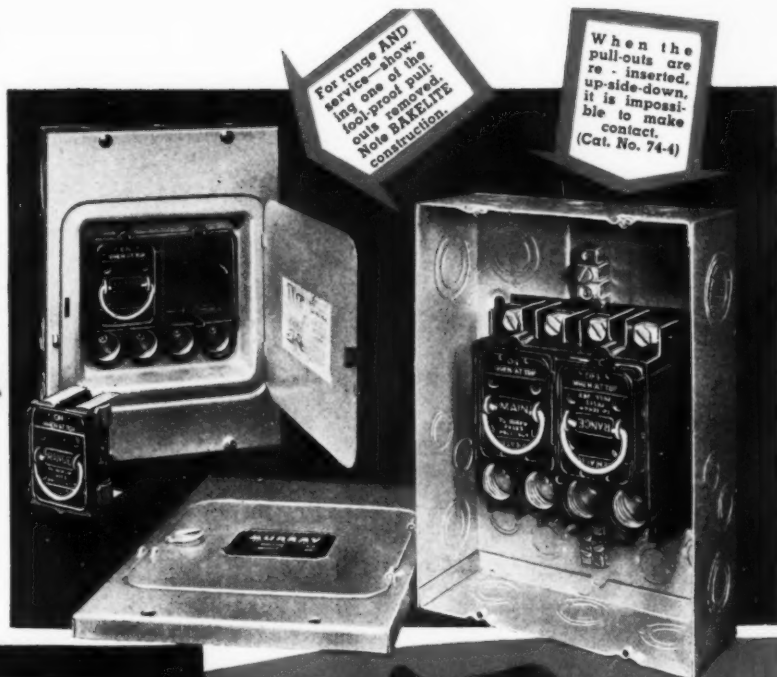
GENERAL ELECTRIC

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THEY'RE **NEW!**



Murray

PULL-TYPE RANGE & SERVICE SWITCHES

Metropolitan Device Corporation,
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NOW, besides the easiest, quickest installation known—besides even better, better-looking construction—besides far simpler, sturdier design, both electrically and structurally—a 60 ampere, No. 72, single pull-out type switch is available in Bakelite, as well as the 60 ampere double, No. 74-4, which has already jumped 'way ahead of expectations in popularity. Get the full story on these new-day, time-and-work-saving range and service switches—all typical of years-ahead MURRAY MODERN METHODS. No obligation.

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INCREASED INDUSTRIAL ACTIVITY DEMANDS EXTRA LIGHT

*For Precision Operations . . . Rush Production . . . Inspection
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A NEW FLUORESCENT LIGHTING UNIT



The FLUR-O-LITER

Provides "cold light" of soft diffused quality which improves inspection and Precision Operations. Designed for two of the new exceptionally efficient 48" white and daylight Fluorescent lamps and featuring new type auxiliaries—high power factor—minimized flicker. Individual reflectors are Alzak aluminum hinged to housing for instant access to wiring, sockets, etc.

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The VAPOR-SEAL REFLECTOR

A dome-type fixture with the entire reflector opening covered with heat-resisting glass. Weather, moisture and vapor proof. For installation in locations where combustible, organic dusts are in suspension and locations where ignitable materials are present as covered in Class II, Group G and Class III and IV listings of the Underwriters' Laboratories.

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The RLM SILVER BOWL DIFFUSER

Engineered to the unique indirect lighting characteristics of the Silvered Bowl Lamp. Combines large Alzak aluminum and porcelain enameled steel reflectors to produce soft, well diffused light. As with many Benjamin units, it is available with patented TURNLOX hood construction which permits the reflector and lamp to be removed as one unit for easy cleaning on floor.



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Use Benjamin Sales Assistance to SELL MORE LIGHTING NOW

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BENJAMIN

TRADE MARK

LIGHTING EQUIPMENT

Electrical Contracting

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A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction—industrial, commercial, and residential.

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these rigid routine inspections

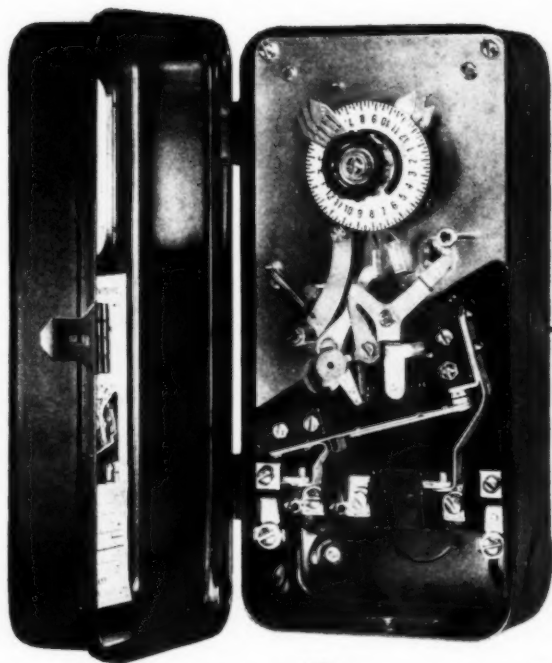


The clearance between the rotor magnet and the stator plate of all motors is precision checked, assuring free-running motors with ample torque.



Part of the inspection routine of each Sangamo Time-Switch is a motor-insulation breakdown test of at least 10 times rated operating voltage.

THE CORRECT basic design of the Sangamo Time-Switch... its slow-speed, high-torque motor... its pure silver contacts... its many features of control—these factors alone assure an accurate and dependable product. However, not only correct design, but precision production methods and rigid routine inspections—a few of which are pictured and described here—these are the extra safeguards that insure your profits against "free" service calls when you install a Sangamo Time-Switch.



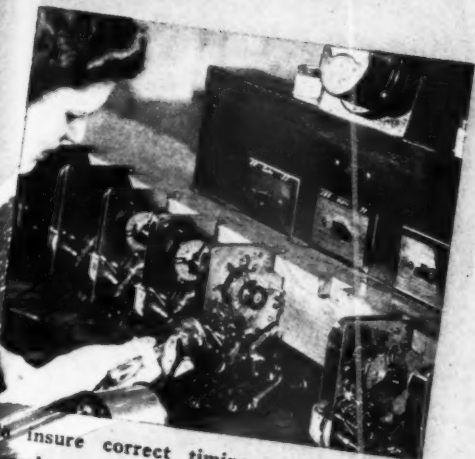
WHEN YOU INSTALL A SANGAMO

SANGAMO ELECTRIC

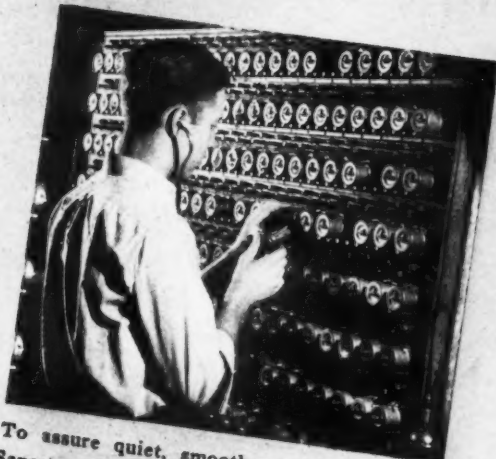
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SAFEGUARD YOUR PROFITS



To insure correct timing with less than normal voltage, Sangamo Time-Switches must run synchronously during a test at 75% of rated operating voltage.



To assure quiet, smooth-running motors in Sangamo Time-Switches, a specially trained operator checks every single motor with a sensitive stethoscope.



The contact spring-tension inspection assures proper contact pressure of mechanical contacts. This is one of the many tests Sangamo Time-Switches must pass.



After the motor, contacts and other vital parts have been thoroughly tested, a master craftsman makes the final adjustments, before giving the Time-Switch his okay.

TIME-SWITCH



The new catalogue No. 1000 contains pictures, descriptions and prices of all types of Sangamo Time-Switches.

COMPANY

SPRINGFIELD
ILLINOIS

Make it happen to you! Wiring survey shows concern how to end \$2,399 yearly power loss



(At left) Industrial analyzer in use. Equipment like this can help you make money.

Charts from a graphic meter used in a wiring survey by a large industrial concern showed that a power factor of 70% with all machines in operation was causing low voltage trouble at motor terminals. Further check-up pointed the way to considerable savings in power losses. The survey revealed that by raising the power factor a saving of \$705 a year could be made; that the increased energy consumption of too-large motors could be eliminated, thus saving \$1,152 a year; and that interest and depreciation charges on excess motor capacity amounting to \$542 could be saved—a total of \$2,399. This is characteristic of possible savings through proper wiring systems and adequate conductor sizes.

Photo courtesy Westinghouse Electric & Mfg. Co.



*They wouldn't run a 1/2" hose
to a fire plug—but nine out of ten firms connect
inadequate conductors to motors*



Anaconda Duracode—Duracode insulation represents the first successful attempt to combat the destructive effect of heat and oxidation with one all-purpose building wire. Write for the facts about this improved industrial cable.

Your Anaconda Distributor Will Help You

The two books shown here can be obtained from your regular Anaconda distributor. They give complete directions for making plant wiring surveys . . . provide a step-by-step guide for making a general survey on wiring, motors and lighting . . . a report section listing conditions found in each feeder, sub-feeder and branch circuits . . . recommendations for plot sketches and plans of existing wiring system layout. Ask your Anaconda distributor for your copies today.



INADEQUATE wiring responds to overloading just as small diameter hose on a pressure line does. Power lines are choked; then fail completely. But, because power "leaks" are invisible, power losses in industrial plants often continue unnoticed and bring ultimate breakdown closer and closer.

Nine out of ten industrial plants in the country, authorities say, are unconsciously putting up with needless power losses—and inviting electrical breakdown—that could be stopped simply by rewiring circuits.

Where these power losses are occurring and how they can be corrected—this is the information industrial plants need. And you can give it to them by making a wiring survey.



**USE MODERN
IMPROVED**

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OCTOBER, 1939

And More Fun

IF ALL THE ELECTRICAL CONVENTIONS I have attended since 1905 were laid end to end—I'd hate to be around. But I close my eyes and look back and there they are. Contractors, wholesalers, manufacturers, power company men—sitting in meetings, expounding, arguing, waving their hands.

MY FIRST ONE WAS IN DENVER. It was the old NELA, and two things I remember. Against all tradition, for the first time they talked for a whole session about selling. It was historic! And the other thing? Well, at the rodeo, the black horse broke the cowboy's leg.

WHAT HAS COME OUT OF THIS BIG TALK? In my opinion, almost everything that's happened in the development of the electrical industry since then, has come out of it. For that's the way we've found our leaders. That's the way we've passed our good ideas around.

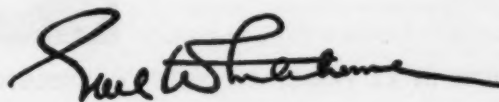
A MAN WORKING ALONE can only do small local things. So nothing much is accomplished. But he goes to a meeting and tells about it. Then other men take his experience, help him improve it, and apply it widely in a bigger way. Soon the one man idea matures and becomes powerful and everybody benefits.

WITH THAT DENVER MEETING IN MY MIND, I am intrigued by the fact that the NECA Convention, in Philadelphia this month, will also be definitely focussed on selling. Again this is historic. For contractors are still neglecting this part of their business. Perhaps this convention may start this old idea really rolling with us at last.

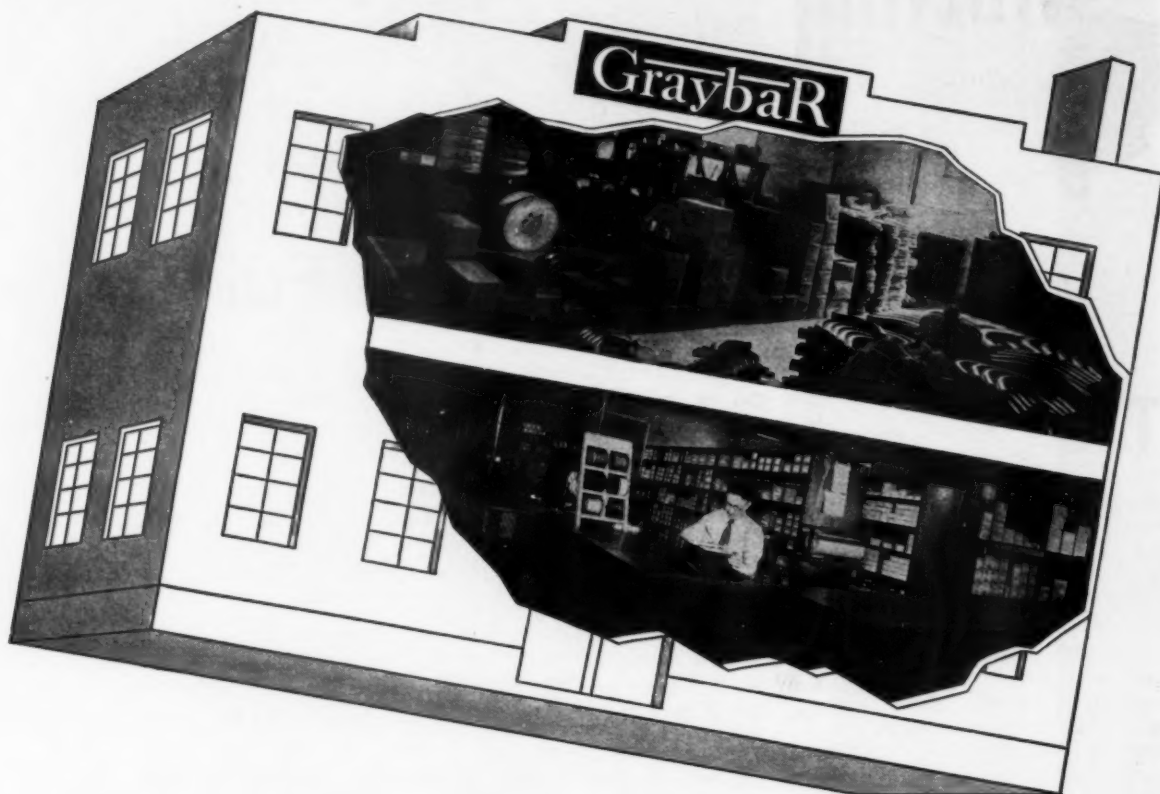
LABOR RELATIONS WILL BE ANOTHER MAJOR THEME at this convention—a vital issue. But there's a selling edge to this as well. It is scheduled for discussion. For selling motivates all branches of a business today. And no contractor can hope to prosper in his work without doing it well.

MEN WHO NEGLECT THEIR SELLING, most of them, make a very simple mistake. They get the notion that selling means wasting time going around asking people to buy. That is not even the tail on this kite. Selling really means having a plan, a policy, a program, a spirit and a purpose that makes your business more interesting, active, successful—more fun.

IF THIS IDEA APPEALS TO YOU—well, come to Philadelphia and say so. We'll all help get you started.



YOUR WAREHOUSE IS READY



... and it won't cost you a cent!

THE WAREHOUSE we maintain for your convenience is different from ordinary warehouses...

The stocks it contains have been carefully built up for years to meet electrical contractors' needs... *whatever those needs may be.*

Whether you specialize in industrial, commercial, or home installation—you'll find your Graybar warehouse amply stocked with the items you need.

In some cases where contractors have had special needs, we have been able to build special stocks to meet these needs—and will do so again where justified.

Furthermore, you'll find your Graybar warehouse manned by experienced men trained to give you quick

and intelligent service, either at our handy pick-up counter or by speedy truck delivery.

Finally, you get this assurance—every item from Graybar can be depended upon. Graybar's guarantee backs you up on every job where you use our materials.

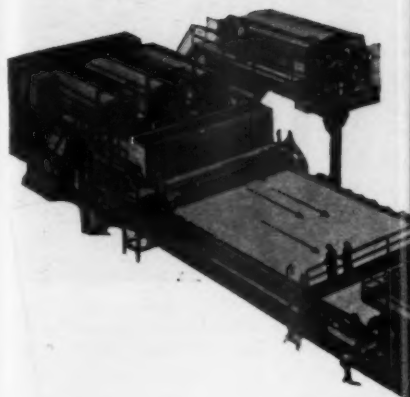
Get more *plus value* for every dollar you spend... by making Graybar your supplies' headquarters.



A FEW KEY PRODUCTS available through GRAYBAR

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- BOXES—ALL TYPES
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- CONDUITS
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- TOOLS
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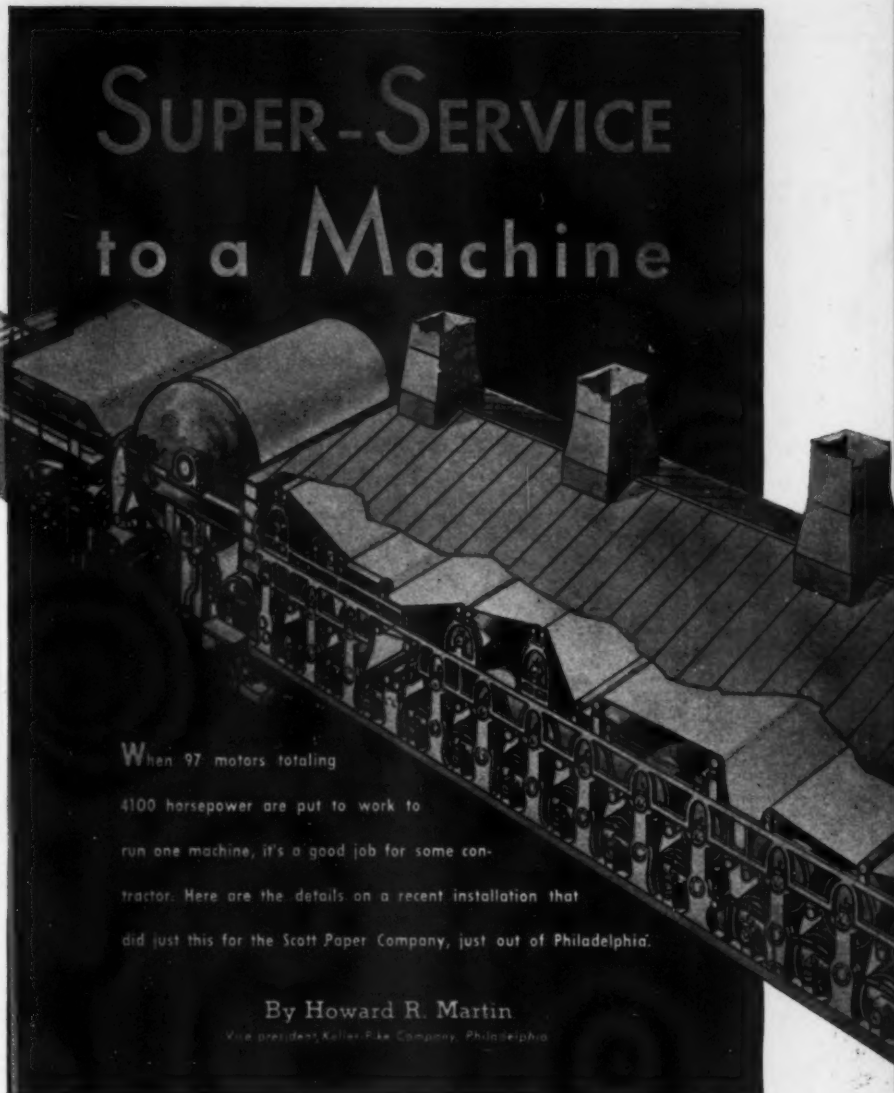
THE Keller-Pike Company has just connected 97 motors and 4100 horsepower to serve one machine. Here is an outstanding example of the modern trend towards high specialization of power for modern machinery. But this unit, by the time it is running and making money, will cost several million dollars. It is worth all the pampering it can be given.

The jump from the old system of using one motor to run any man's factory through line shaffing, to the 6 or 12 motors found on present day machine tools, was a big accomplishment. But this is something else. It is an ultra-modern super-service to a machine; a deliberate marshalling of power auxiliaries to a production machine unit to increase its output and efficiency.

This machine, recently installed by the Scott Paper Company, manufacturers of the famous "Scottissue" products, at their Chester plant, grinds out paper toweling. As if by magic, wet pulp, fed into the jowls of the machine at one end, emerges 240 feet away, as the soft crepe tissue toweling, so familiar to all of us. Two grades of these towels can be produced by this same unit.

This production giant, 240-ft. long, 23-ft. wide, 22-ft. high and weighing 600 tons, required a special building to house it. The basement of this 270-ft. building contains all the auxiliary equipment, including pumps, compressors, motor generator sets, motor controls and conduit runs. Only one control panel and a few main drive motors are on the first floor. Main service feeders, exhaust fans and controls are in the attic.

The functional operations of the 97 motors include: wet pulp beaters, large pulp grinding machinery, main dryer



SUPER-SERVICE to a Machine

When 97 motors totaling

4100 horsepower are put to work to

run one machine, it's a good job for some con-

tractor. Here are the details on a recent installation that

did just this for the Scott Paper Company, just out of Philadelphia.

By Howard R. Martin

Vice president Keller-Pike Company, Philadelphia

drives, motor-generator sets, frequency changer, agitators, pumping equipment, air compressors, exhaust fans, blowers and small auxiliary equipment. These electrical accessories are organized and installed as follows:

Service

Power comes in and is distributed at 550 volts, 3 phase, 60 cycle, from the private power plant of the Scott Paper Co. A "floating" tie-in with the Philadelphia Electric Company is maintained to help handle the plant peak load.

Three 6-inch transite ducts carry the main service feeders over a steel trestle to the new machine building. This trestle is grounded by a bare copper conductor clamped along its entire length. One feeder of six 500,000 cm r.c. cables carries the 600 kw. motor generator set. A second feeder of six 500,000 cm r.c. cables serves the pulp preparation machinery panel. A third feeder of nine 500,000 cm r.c. cables feeds two power distribution panels which control the balance of the motors in the building.

Sub-Distribution

The sub-distribution system consists of three main power panels, which control the large motors direct, and a number of starter groups through sub-feeders. These starter banks, ranging in size from 2 to 20 starters, control all of the smaller motors serving the towel machine by individual circuits.

A starter rack contains an ammeter, or load indicator, a disconnect switch and a magnetic starter with a push button control for each individual motor circuit. All circuit and control conduit is run down through the floor along the basement ceiling and up to the motors, thus keeping all conduit out of sight on the main floor.

D.C. Main Drive and Control

To obtain the greatest possible flexibility of speed control on the main drive of the machine, direct current motors were used. The direct current was obtained from a 600 kw. 250 v. d.c. motor-generator set driven by a 750 hp. synchronous motor. One 300 kw. d.c. generator was coupled to each end of the synchronous motor shaft.

NECA in
Philadelphia



On the first floor, two 300 hp. d.c. motors drive the main dryer drums, one at the wet and one at the dry end of the machine. These motors are controlled by a main d.c. control board adjacent to the m.g. set in the basement and an auxiliary control panel on the first floor.

Speed control of these main drive motors is obtained through motor operated resistance banks on the main d.c. panelboard. These banks are electrically connected to tachometers on the d.c. motors. Synchronization of the d.c. motors is important to prevent a break in the continuous line of paper passing over the dryer drums. Pilot generators are used to synchronize the speeds of these two motors.

A.C. Auxiliary Control

All control cubicles for the synchronous motors are located in the basement, out of the way of the operating crew. This is true also of the main d.c. and a.c. power panels and starter banks. The only controls on

the main floor are the auxiliary d.c. panel and push button stations to control the a.c. motors.

Push button stations, in general, are vapor proof because of the humidity and water present in the paper processing. Electronic control is employed to signal the operators if the paper breaks. Two electric eyes are focused on the 15 foot width of the paper, one at the wet and one at the dry end of the machine. If the paper breaks, these electric eyes blow a horn which warns the operators to shut down the motors.

Most of the motors are controlled by one or more push buttons located at convenient points along the machine structure. This is in addition to the controls at the starters. Fan motors in the attic can be shut down from the first floor by stop buttons. But they must be started at the motor in the attic.

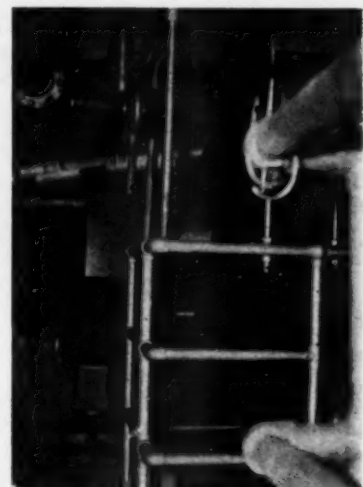
This was arranged deliberately to insure proper maintenance of the fans, since they are checked each time they are started. These fans exhaust the heat dissipated by the numerous steam filled dryer drums.

Auxiliary Equipment

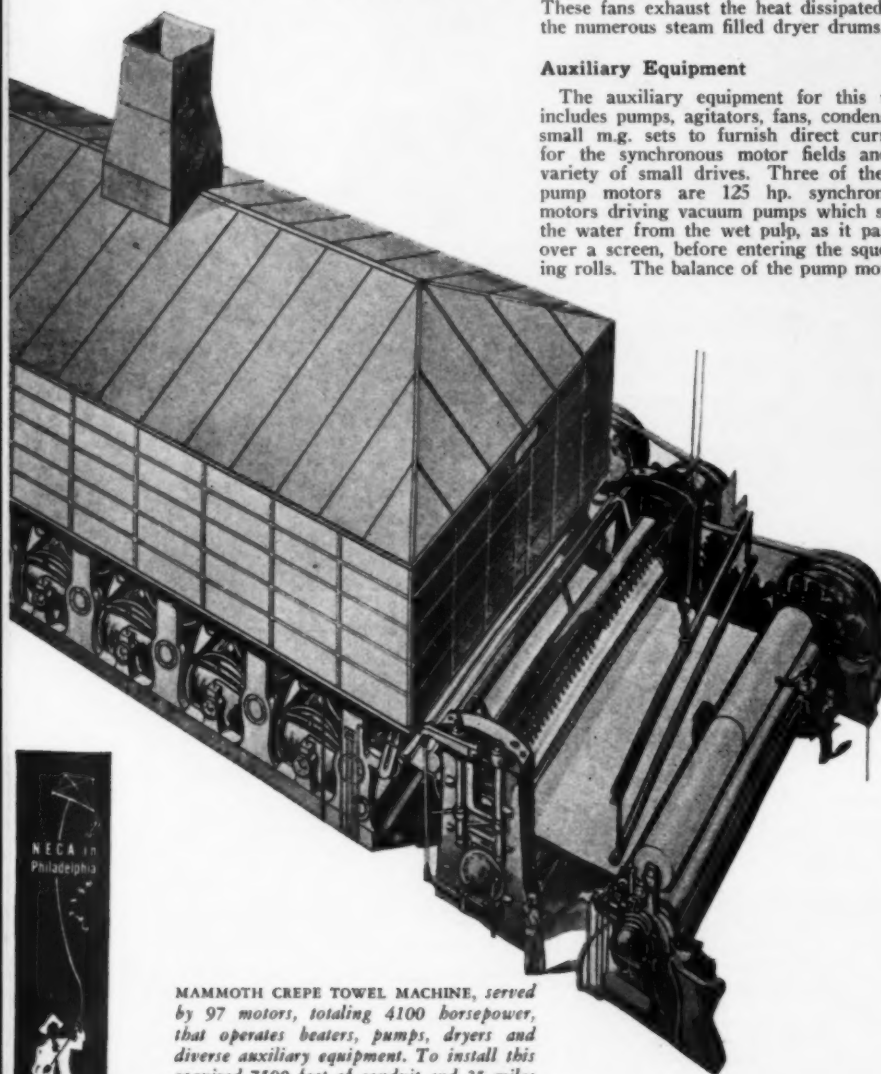
The auxiliary equipment for this unit includes pumps, agitators, fans, condensers small m.g. sets to furnish direct current for the synchronous motor fields and a variety of small drives. Three of the 26 pump motors are 125 hp. synchronous motors driving vacuum pumps which suck the water from the wet pulp, as it passes over a screen, before entering the squeezing rolls. The balance of the pump motors



FEEDER RUNS—The main feeders, after leaving the junction box, run along the attic floor, then drop down to basement panels.



DIFFERENT DRIVES are used throughout this installation. This is one of the many V-belt drives for motors located in limited quarters.



MAMMOTH CREPE TOWEL MACHINE, served by 97 motors, totaling 4100 horsepower, that operates beaters, pumps, dryers and diverse auxiliary equipment. To install this required 7500 feet of conduit and 35 miles of wire. This machine is 240 feet long, 23 feet wide, 22 feet high and weighs 600 tons. It occupies its own building.



vary from 5 to 60 hp. in size. The ten attic exhaust fans range from 5 to 20 hp.

High speed slitters, at the dry end, cut the "parent" rolls on which the paper toweling is wound after it emerges from the dryers. These are operated at 120 cycles and a motor generator frequency changer supplies current of this frequency. After the "parent" rolls are cut they are taken to a finishing building where they are cut to size, rolled, folded, wrapped and packed in cartons ready for shipment.

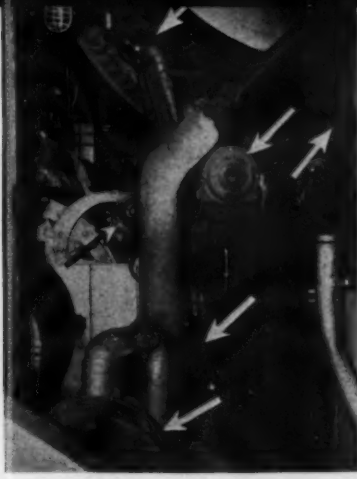
Lighting Equipment

Lighting for this new machine building is taken from transformers at 115 volts, 3 phase, 3 wire, delta, ungrounded. The 550 volt, 3 phase primary feed is taken from the power plant through six 4/0 rubber covered cables in 3½-in. transite duct. There is only general lighting in the basement and on the first floor. But auxiliary lighting is provided on the machine itself.

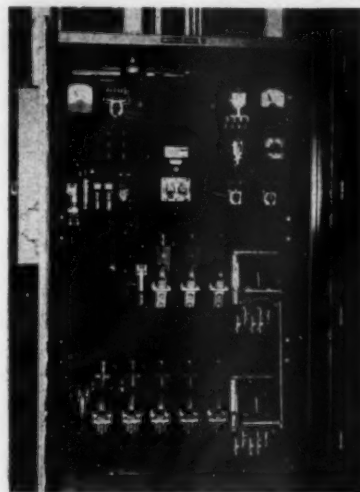
For first floor general lighting, deep bowl reflectors are used set flush in the ceiling. They are connected by reinforced cord to outlets run along the attic floor



AUXILIARY CONTROL panel on first floor is interconnected with main d.c. panel in basement. Arrow indicates push buttons for control of a.c. motors.



AUXILIARY EQUIPMENT motors are mounted on the machine. The number of motors, indicated by arrows, shows how a large percentage of the 97 motors are distributed.



CONTROL CUBICLE—Housed in individual cubicles, the control panels for all the synchronous motors are located in the basement, out of the way of the operating crew.



DRYER DRIVE—One of the two 300 hp. d.c. main drive motors, on the first floor of the building, driving the dryer drums. This one is at the dry end of the machine.

What The 97 Motors Do

FUNCTION	NO. OF MOTORS	TYPE	H.P. TOTAL
Pulp Processing	2	Synchronous ..	300 600
Machine Jordan	1	Synchronous ..	400 400
Paper Processing	2	Synchronous ..	200 400
Main Dryer Drives	2	Direct Current	300 600
400 KW M-G Set	1	Synchronous ..	750 750
M-G Exciter Sets	2	Squirrel Cage.	30 60
Frequency Changer	1	Squirrel Cage.	5 5
Vacuum Pumps	3	Synchronous ..	125 375
Pumping Equipment	23	Squirrel Cage. 7 1/2-40	386
Agitators	10	Squirrel Cage.	2-40 197
Fans and Blowers	12	Squirrel Cage.	5-20 145
Vapor Absorption	1	Squirrel Cage.	30 30
Pulp Screen Drive	1	Squirrel Cage.	25 25
Other Screen Drives	3	Squirrel Cage.	3 9
Screen Shake	3	Squirrel Cage.	3 9
Grinder Drive	1	Squirrel Cage.	20 20
Grinder Wheel	1	Squirrel Cage.	10 10
Various Auxiliary Drives ..	27	Squirrel Cage.	1/4-15 103.75
	97		4,134.75



GROUPED CONTROL—This typical bank of controls feeds individual motors through (1) an ammeter or load indicator, (2) a disconnect switch, (3) a magnetic starter and (4) a push button.



D.C. POWER—These 300 kw dual generators, in the basement, driven by a single 750 hp. synchronous motor, furnish the direct current for the main dryer drives on the towel machine.

beams. The machine lighting consists of a row of vapor proof fixtures along each side of the machine on the main floor. At other points, in and under the machine, localized light is installed for use in watching the processing or checking motors, valves, bearings.

Engineers of the Scott Paper Co., Stone and Webster Engineering Corp., and the Keller-Pike Co., cooperated in the installation of this machine, said to be the largest and most modern of its type in the world. The electrical control equipment and installation work cost approximately \$125,000.

About 7500 feet of galvanized conduit and 35 miles of wire were installed. Wire sizes varied from No. 14 on control to 500,000 cm on service feeders. Minimum wire size on branch circuits was No. 12. Thirty per cent rubber covered wire was used throughout the installation.

Eighteen and 20 conductor color coded control cable was employed extensively between the main and auxiliary control panels. All sub-feeders and branch circuits were designed to carry a 100 per cent overload.

The Keller-Pike Company completed the electrical installation in two and a half months, with an average crew of 50 men. But for one week a peak crew of 103 men was necessary.

This installation we feel is a fine example of electric service to modern production machinery. So, as industry increases its demands for motors and auxiliary equipment, and control concentrates more functions in large highly automatic units, the use of electricity broadens and becomes more intricate. It adds to the responsibilities of the industrial contractor. But it also is steadily bringing him more opportunity.

PUMPING EQUIPMENT is an important factor in the operation of this huge machine. Arrows indicate a number of the 26 pumps necessary to produce paper towels.



This NECA Convention

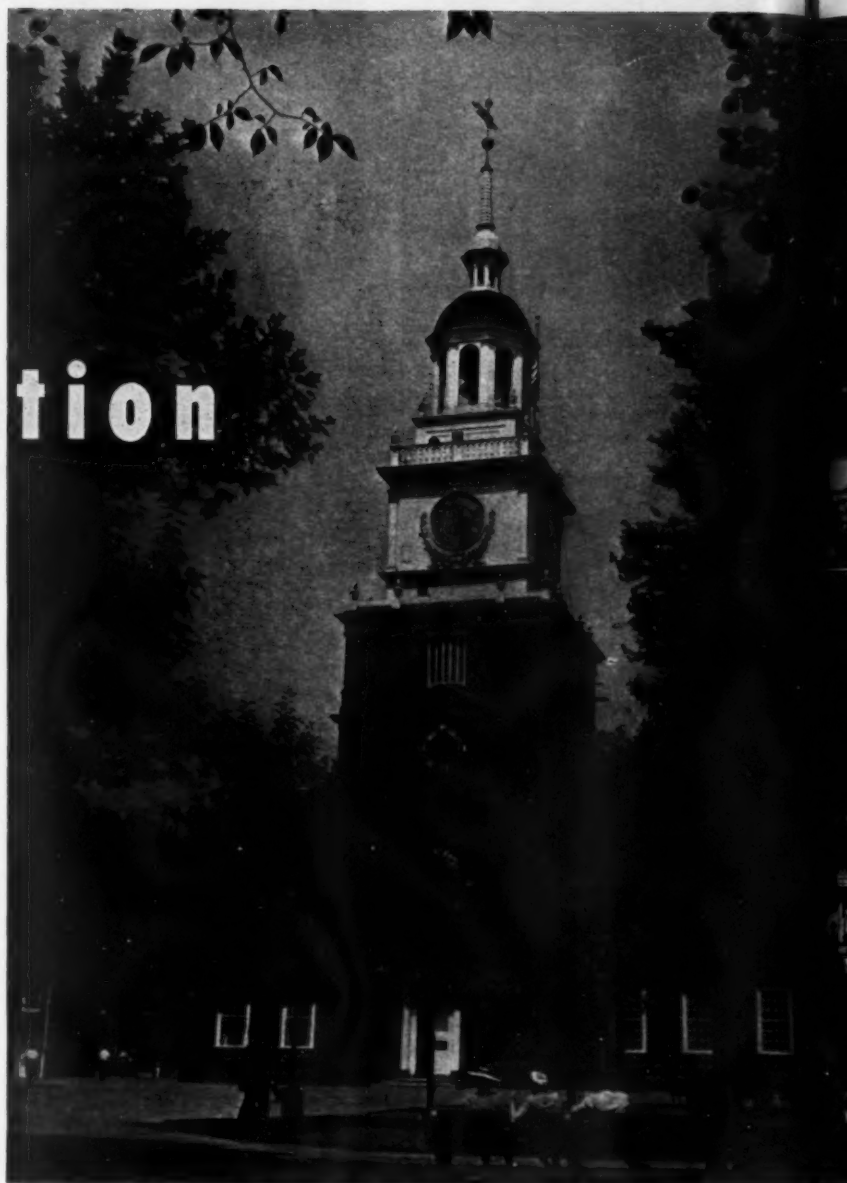
A word about the setting, the plans, the program and the opportunity.

PHILADELPHIA, William Penn's famous "city of brotherly love," is a good place for electrical contractors to visit. It was the scene of Ben Franklin's kite and key experiment. This, of course, meant nothing to our business. But it gave proof that the electric spark of the leyden jar was cousin to the crashing thunder bolt, and did more to build up public interest in electricity than anything that had happened or that followed for a long time.

And here in Philadelphia are many interesting things to see. The historic background of the city is familiar to all. But it is something to actually stand in Independence Hall, before the Liberty Bell, and know that here the American Congress struggled through the darkest days of the Revolutionary War with Washington's army in Valley Forge. And here, when the war was over, the United States Constitution was established.

Delegates to the 37th annual convention of the National Electrical Contractors Association will be richly repaid if they will spend an afternoon or two in this kind of sightseeing.

The Convention itself will be held in the Bellevue-Stratford Hotel. It will offer the combination of a meetings program and an exhibition of electrical



PHILADELPHIA OFFERS first to all Americans that lovely national shrine, Independence Hall. It stands in a modern setting interesting to electrical men for electrical progress here is far advanced.

products. The program will review in discussion the pressing problems of electrical contractors. The exhibit will marshal the latest contributions of the electrical manufacturers to modern technique in installing wiring and electrical equipment.

Meetings begin on Monday morning, October 9th with NECA President Earl Peak in the chair. There will be morning sessions Tuesday and Wednesday, afternoon meetings Monday and Wednesday.

A banquet will be held on Wednesday

evening in the Bellevue-Stratford ballroom. The entertainment program includes visits to Independence Hall, Valley Forge, and the Dupont Horticultural gardens. Friday and Saturday are reserved for the New York World's Fair and arrangements are made for the convention to travel direct from Philadelphia to the World's Fair and to enjoy it together.

The Convention Exhibition has been made possible by the Electrical Constructors, Inc. of Philadelphia, the NECA local chapter. The Convention





NECA CONVENTION PROGRAM

OCT. 9—MONDAY MORNING— Opening Session

"Address of Welcome"
Horace P. Liversidge, President
Philadelphia Electric Co.
"Twelve Months Progress"
Earl Peak, President of NECA
Reports by Divisional Executive Commit-
teemen

MONDAY AFTERNOON—Union Shop Contractors Meeting

"Address of Chairman"
E. C. Carlson, Chairman Labor Re-
lations Committee
"Labor's Willingness to Do Its Part"
D. W. Tracy, President of Interna-
tional Brotherhood of Electrical
Workers
"The Council on Industrial Relations"
L. K. Comstock, Chairman of the
Council
"Let's Pass the Gravy"
Earl Whitehorne, Editor of *Electrical
Contracting*

OCT. 10—TUESDAY MORNING

"Wasted Watts"
J. Walter Collins, Secretary Electrical
Contractors Association, Chicago
"Neglected Costs"
Ray W. Ashley, Research Dept., Elec-
trical Contractors Assn. of Chicago
"Competition and the Law"
Walter J. Walsh, Attorney, San Fran-
cisco, California

TUESDAY AFTERNOON

Golf—Overlook Country Club
Tour of Franklin Institute

OCT. 11—WEDNESDAY MORN- ING

"More Effective Selling—the Key to
Electrical Contracting Business"
Howard Williams, Vice President
Tradeways, Inc., New York
"Your Business and the Proposed Code
Changes"
George Andree, NECA Member on
Electrical Committee, NFPA
Election of Officers and Executive Com-
mitteemen

WEDNESDAY AFTERNOON

Union Shop Contractors Meeting
Report of Field Representative Paul M.
Geary

WEDNESDAY EVENING

Annual Banquet
Presentation of James H. McGraw
Award

OCT. 12—THURSDAY MORNING

"Mobilizing the Construction Industry"
F. Stuart Fitzpatrick, Chamber of
Commerce of the U. S., Washington.
"Home Building for the Low Income
Brackets"
Joseph O'Brien, John B. Pierce Foun-
dation, New York
Report of Resolutions Committee

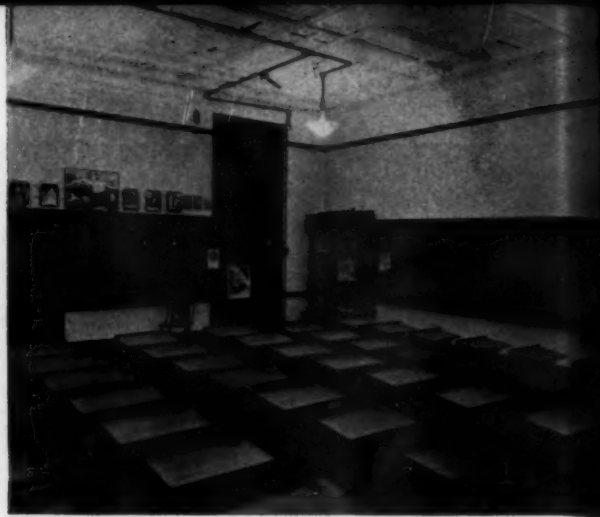
OCT. 13—FRIDAY

National Electrical Contractors Day at
the New York World's Fair

Committee, headed by W. E. Frazer of the H. B. Frazer Co., went to work a full year ago planning for this party and for the past seven months Ernie Hedler, managing director of the group, has given most of his time to developing the program and the Product Show. Some 50 manufacturers are participating with a variety of equipment ranging from the service entrance to the outlet and the switch. The study of these new products will be one of the most valuable opportunities offered by the Convention.



CLASSROOM BEFORE relighting was started. Here bowl enameled lamps in open prismatic shades are typical of the old style lighting. The intensity in these rooms ranged from $1\frac{1}{2}$ to 5 foot candles.



CLASSROOM AFTER new luminous bowl indirect fixtures were installed, with an average intensity from 15 to 18 foot candles. Arrows show metal mold circuits which ceiling ridges hide.

More Wiring for the 3 "R's"



CONTROL SWITCHBOARD in the d.c. generating plant of a vocational school. The utility standby service is a.c. New panels, to transfer the load on either service, were added.

TYPICAL SERVICE installed in Philadelphia schools, embracing metering equipment, entrance switch and distribution panel, as used in the smaller buildings.



Nine Philadelphia contractors rewire 175 schools to provide capacity for better lighting. Almost complete new systems required — Interesting conditions encountered — Unique methods used.

By August Eckel

ELECTRICAL contractors of Philadelphia were called in to modernize the wiring of 175 school buildings during the past year. These schools ranged in age from 10 to 72 years. The wiring system of each structure was almost completely revamped.

Nine of the Quaker City's leading contractors were awarded contracts to improve these school lighting systems. Those sharing the business were:

1. Electric Power Construction Company.
2. Electro Construction Company.
3. Enterprise Electric Company.
4. Ford & Morris.
5. H. B. Frazer Company.
6. Keystone Engineering Company.
7. Morris Newmark & Bros.
8. W. V. Pangborne Company.
9. Ross Electric Construction Company.

These schools were grouped into nine contracts, including elementary, junior and senior high and vocational schools. The smallest number entrusted to any one contractor was nine and the largest was 36.

In most buildings, the electrical specifications called for new services, feeders, branch circuits, panels, fixtures and alterations to present switchboards. Intensities were increased from the old standard of $1\frac{1}{2}$ to 5 foot candles to a new standard of 15 to 18 in regular classrooms and 25 to 30 for special classes.

Semi-indirect units with inside frosted mazda lamps for general lighting replaced open bottom prismatic reflectors in many of the buildings. In wood and machine shops, glassteel diffusing units were used with auxiliary localized lighting on the machines where necessary. Daylight glassteel diffusers were used in the textile classrooms. A special trial installation of fluorescent lighting with electronic control was made in one of the "sight saving" classes.

A number of the high and junior high schools had large auditoriums, in which the lighting had to be revamped. Of the 175 buildings, 71 had their own private generating plants, some a.c. and some d.c., operating in conjunction with a "standby" service

Electrical Contracting, October 1939



PRISMATIC LENSES in ceiling fixtures and continuous cove lighting, flood this auditorium with 16 foot candles. Arrows point to continuous coves above balcony.



PRISMATIC LENSES provide high intensity illumination for this gymnasium with good diffusion, so that participants in all sports are free from glare interference.

from the Philadelphia Electric Company. Here revamping of switchboards was necessary.

Originally the "standby" in most schools, was a 30 ampere service for emergency use. But the new a.c. service is large enough to carry a large portion of the lighting load of the building under normal conditions. During abnormal loads the a.c. service carries the peak in conjunction with the d.c. plant.

In one group of three schools, a steam driven 400 kw d.c. generating plant serves all buildings. The new standby a.c. service in this group was increased to 600 amperes. All motors in the buildings are d.c. In the winter months d.c. is used exclusively for power and light and the exhaust steam from the engines is used for the heating plant. In the summer months, when steam is not generated, the a.c. service is used, with a small motor

generator set for the power load.

One of the many interesting features of this project was encountered in the schools having their own d.c. generating plants. The utility standby service was a.c. The problem was to supply the same circuit either by the d.c. or the a.c. service. During peak loads some circuits might be d.c. and others a.c. A system of barriers in panels and pull boxes was devised to avoid duplicate circuits.

The lighting circuits in the old buildings were of the No. 14 two wire type. In general, all the new systems are of the No. 12 three wire grounded neutral type. In some schools where the load required a polyphase service,

four and five wire distribution was used, depending upon the phase of the incoming service.

In fireproof structures, where the conduit was concealed, new wire was pulled into existing conduits, and three No. 12 wires replace the two No. 14 wires of the old circuits. Existing feeders were used to supply loads up to their capacities. New feeder conduits and wire were installed, concealed wherever possible, to carry the balance of the increased load. Entirely new services of larger capacity were needed to supply the additional load. Metal molding was used for extensions to the new fixture positions.

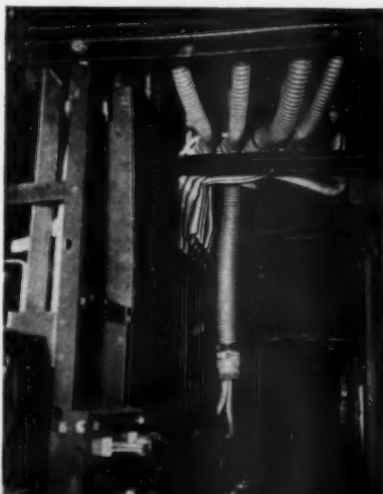
In a number of schools, the original feeders were lead covered cable in concealed conduit. In these cases, new moisture resistant rubber covered cables were used. This permitted the use of larger copper in the same conduit to carry the increased load.

In many of the non-fireproof buildings, all lighting panels were in the basement. Here, separate risers were installed to feed each tier of rooms. Usually a three wire circuit served each room. New feeders were run to the panels in many cases. New services were installed and wherever possible the present metal molding on the ceiling branch circuits was retained.

Standard 30 percent rubber insulated wire was used in the entire project. The 40 percent conduit fill rule was followed in all but a few cases, where local inspection authorities permitted deviation from the rule to meet specific job conditions. The standard utility supply voltage was used in all schools.

[Continued on page 74]

PANEL CONNECTIONS behind transfer panels on d.c. — a.c. switchboard. Feeders leave panel and enter enclosure above the board. Built-in barriers separate a.c. and d.c.



LIGHTING PANEL for gymnasium lights in a vocational school. The upper half is typical of lighting panels in all the schools. The lower half provides remote control from push buttons in the gym.

NECA in Philadelphia



ACTION UNDER the lights—A night game at Shibe Park showing intensity in the outfield.

Ball Park Job in Philadelphia

When famous Shibe Park installed 185 foot candles for night playing, the electrical contractor took on both operation and maintenance on a contract basis.

"PLAY BALL!"—"Crack!" goes the bat! The crowd roars! And ten thousand men in Philadelphia offices used to glance at the clock and groan because they couldn't see the game. But now Shibe Park, home of the famous "Athletics," is drenched in 185 foot candles of night light and the fans can hear the welcome ring of the umpire's voice "after hours."

Many other cities have lighted their ball parks for night playing. But the Shibe Park installation is notable and will be interesting to the NECA convention delegates for the following reasons:

1. It sets a new high of 185.8 foot candles of intensity in the infield and 118.8 in the outfield. It compares with intensities of 50, 70, 80 and 100 foot candles found on most other major ball parks where there is night playing.



By Howard L. Miller,

President

Utilities Engineering Company, Philadelphia

It is slightly higher than the similar installation recently completed at Comiskey Field, Chicago.

2. The system provides 780 flood lights equipped with 1500 watt lamps; also, important safety features.

3. This contractor now maintains and operates the system.

The American League Baseball Club, the Westinghouse Electric and Manufacturing Company, and the Utilities Engineering Company cooperated in developing this job. Its seven principal features are as follows.

1. Towers—Eight steel 20 ton towers were used. Towers No. 1 and No. 2, near home plate, have 60 floodlights each.



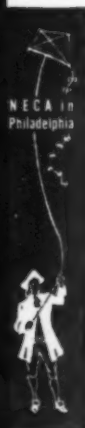
A CLOSEUP of section of secondary circuit conduit on cross arm showing floodlight connections.

All other towers have 110 floodlights each. The floodlights are on the steel cross arms at a minimum of 120 feet above the ground. Each arm is about 30 feet long and supports 11 projectors. Protected walkways extend the width of the arm for servicing two rows of fixtures each.

The positions of the projectors were determined by calculations developed by the Electrical Testing Laboratories. Calculated intensities were obtained by projecting the beam of the floodlights on the field from various mounting positions. These angles were then plotted on a lumen chart to determine the amount of light striking any one playing area, and above the ground level in the maximum zone of play.

2. Fixtures—Westinghouse VHR-20 Alclad aluminum floodlights were used, with 1500 watt PS-52 clear bulb general service mazda lamps, base up. The lamps burn 10 per cent overvoltage, which gives 35 per cent more lumens with a 15 per cent increase in consumption. Cooling is by radiation.

A bayonet heel arrangement permits removal of the reflector without use of tools or refocusing. A scale drawing of the



field, with predetermined intensities made it possible to install each floodlight and focus it without being turned on.

3. Service—The Philadelphia Electric Company provides service over dual 2300 volt, 60 cycle, 2 phase, 3-wire primary feeders through oil circuit breaker cubicles. An additional tie-breaker cubicle with an automatic transfer feature is electrically interlocked with the dual service breakers.

The system normally operates with 50 per cent of the total load on each service feeder. Upon failure of either service the automatic transfer switch throws the entire load of 1357 kw. on the remaining service.

Two main switches in the service vault beneath the grandstand control the complete installation. Primary feeders of four No. 4/0, 5000 volt watertight RC cables, in 3 inch conduit, run from the switching equipment to the floodlight towers. Each feeder carries one half of the floodlights on each tower.

The two towers near home plate carry two 50 kva., 2300 volt primary, 115 volt secondary single phase oil cooled transformers. One 75 kva. and one 100 kva. transformer are mounted on each of the other six towers. Primary fused cutouts

protect each transformer. Transformers mounted above the grandstand roof contain "Inerteen," non-inflammable insulating compound. Wire mesh enclosures protect transformers within range of a line drive.

4. Secondary Circuits—The secondary circuits run in conduits to distribution panels mounted inside each tower at the back of the service walk ways. Weather-proof cabinets with fuse gap panels provide one circuit for each fixture.

Branch circuits run in conduit under the walk way, then up and along the cross arms to condulets, that serve two floodlights. Flexible rubber covered duplex cables from the floodlights are spliced to circuit wires in these condulets. Secondary circuits are held within a 2 per cent drop in voltage.

5. Safety—All high and low voltage distribution wire is insulated for at least twice the operating voltage and provided with a special low moisture absorption insulation. Primary conduits and pull boxes have danger signs and are enameled red to identify them. Primary circuits are encased in concrete to a height of eight feet above floor levels.

Under the grandstand roof, they are routed where there is the least possibility of a spectator touching them. Each service feeder and tower were protected against lightning discharges.

6. Operation—An operating contract, with the Utilities Engineering Company, calls for a supervisor and an assistant operator in the main control room during the entire duration of every night game. They energize and de-energize the main breakers and supervise and maintain continuity of service during the game. Operating and maintenance costs for a season approximate \$2,500, excluding cost of current. Cost of current for one game is about \$240.

7. Maintenance—Our company also maintains this installation on a flexible contract basis. The maintenance list includes the following material and service—

- Material Replacements**—
- 1.—High and low tension fuses.
 - 2.—High tension transformer cutouts—150 amp.
 - 3.—High tension transformer cutouts—50 amp.
 - 4.—Lamp renewals.
 - 5.—Floodlight lenses—clear and stippled.

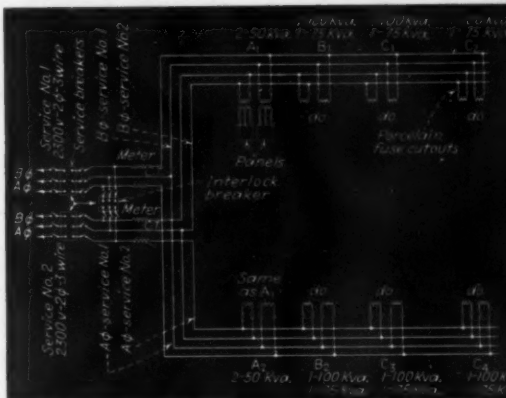
Service—

- 6.—Make pre-game illumination test for five minutes on the day previous to the night game, and for five minutes, three hours prior to game time. Test includes checking the automatic relays in the main control room, checking the circuit breakers and seeing that all the lights are in operating condition.
- 7.—Clean exterior surface of 780 floodlight lenses, three times per season.
- 8.—Clean all floodlight reflectors once a season.
- 9.—Test oil in main control room circuit breakers once a season.
- 10.—Test oil in 16 transformers once a season.
- 11.—Make insulation test on entire electrical system once a season.

A CLOSEUP of one of eight towers, showing battery of floodlights, transformers and servicing walkways.

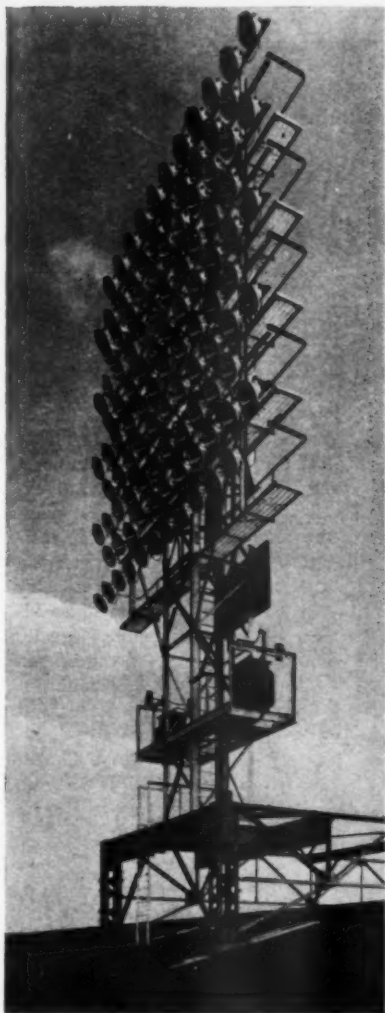
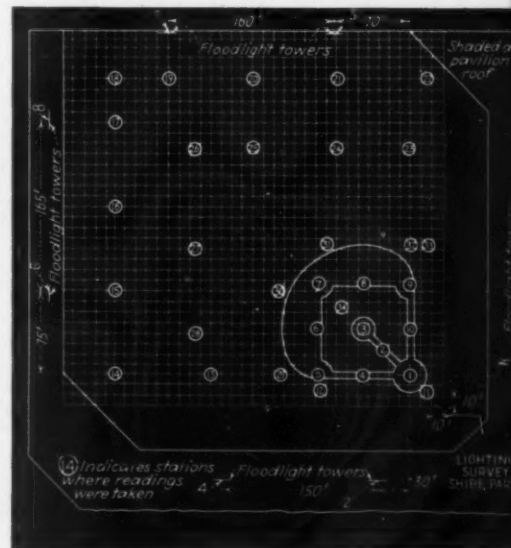
The electrical system was designed and installed by us and the entire installation, consisting of structural steel supports, distribution system and flood lights, entailed an expenditure of approximately \$105,000. A 35 man crew completed the installation in eight weeks. Approximately two miles of conduit, mostly three-inch, and about 7½ miles of wire were installed.

To show the magnitude of the job, with a few trick figures, these 780-1500 watt floodlights operating at 10 per cent overvoltage are equal to 97,250-25 watt lamps on the basis of the lumen efficiency of the lamps only. The complete installation has a total beam candlepower of two billion. That is sufficient light to illuminate a highway from Cleveland to Philadelphia.



SCHEMATIC DIAGRAM of 2300 volt service to floodlight towers.

SCALE DRAWING of Shibe Park, showing towers and method used to focus lights.



Electrical Contracting, October 1939

Contractors in Philadelphia

the city are the innumerable suburban communities, in which modern country homes are as individual as anywhere else.

Philadelphia electrical contractors are organized today in two groups. "Electrical Constructors of Philadelphia, Inc.," is the local NECA Chapter, with a membership of 25 of the union contractors specializing in industrial and commercial work. This association was set up in 1935. In June of this year it established a voluntary Code to foster fair bidding practice in the city. The present officers are president, Wm. F. McCarter of Cates and Shepard; vice-president, W. E. Frazer of H. B. Frazer Co.; secretary and treasurer, W. E. Rubert of Union Electric Contracting Co., and managing director, E. E. Hedler, long prominent in Philadelphia electrical activities.

This organization is endeavoring to raise the standards of electrical construction in Philadelphia, to promote rewiring, to improve the service given by local contractors to local industries. It is fostering better relations between the contractor and the other branches of the electrical industry.

It was this association that extended the invitation to NECA to hold this year's convention in Philadelphia. It has developed the program, made the arrangements, organized the product exhibition and will be official host to the visiting contractors and guests.

The Independent Electrical Contractors Association has a membership of 123 contractors, large and small, union and non-union. It is nine years old and has devoted itself chiefly to promoting a licensing law, which has not yet passed the legislature. They are now working for a city license too.

They have also been active in developing better ethics and coordination in the local electrical industry, better relations with the building trades. Some 29 of its members, who meet the prescribed standards, are advertised by the Association as offering "guaranteed work-

manship." The officers of the association are president, Waldo A. Reizner; vice-president, Joseph S. Miller of Miller Electric Construction Co.; secretary, Harry Bortman of David Bortman; and treasurer, Louis Blum of Keystone Electric Co.

The Electrical Association of Philadelphia is the local electrical industry association. Howard L. Miller, former president and active member of the Constructors is now vice-president of the Electrical Association and chairman of its Contractors Division. This group numbers about 30 electrical contractors doing industrial and commercial work and has been operating for ten years.

The Electrical Association has also a contractor-dealer group, organized to promote a larger volume of business for these members in residence wiring and appliance sales, and in small factory and store work. Prominent in this activity have been campaigns to promote refrigeration, range and water heater sales, adequate wiring, commercial cooking, oil burners, air conditioning, electric kitchens, better light. Local programs tie into all national campaigns to stimulate the Philadelphia electrical market.

The Association maintains a splendid permanent electrical exhibit at its headquarters, conveniently located in the Architects Building. It provides a meeting place for all industry groups and leadership in all activities. It has contributed greatly to the prestige of its members. In fact, the Electrical Association of Philadelphia is probably the most highly developed and effective local electrical league in the country. And it will be worth the time of every delegate to the NECA Convention to visit its offices and exhibit and see what it is doing for the electrical contractors of the Quaker City.

Among its activities are:

1. A clearing house operation—Inquiries come in to the Electrical
(Continued on page 72)

How the industry is organized in this old town where William Penn stands in a blaze of light atop the City Hall waiting to greet you.

MODERN Philadelphia, with its population of 3,000,000, is a city of highly developed middle sized industries. It is a tide water port, ranking second in our maritime commerce. It has large concentrations of the oil refining and textile industries. And yet it is notable for the variety of its industrial activities. There is no dominant industrial influence such as the delegates to the NECA Convention saw last year in Detroit.

Philadelphia electrical contractors, therefore, have an unusually wide market to work in. They are involved with almost every type of industrial process, every imaginable application of electricity in factories for light, power, heat, ventilation and control. They have the huge office structures, stores, institutions and other commercial buildings found in every large city today. They have the homes of this vast population to wire and to modernize.

And Philadelphia homes differ from those of most places, because housing in this city consists largely of the traditional brick row, built by a real estate operator and finished with identical wiring and equipment. Then outside



BUSINESS

Stands Against War

Let us take a clear-eyed look at this thing we call War.

WAR is a political tool for domination or suppression; a device of futility—unless it be waged in defense of our homes, our property or our rights—in the preservation of our liberty. War destroys everything it touches. So completely does it disrupt the order and progress of civilization that humanity falters.

Dangerously widespread amongst our people today is the assumption that our participation in the European War is inevitable. Some mistrust the temper and program of the federal government as likely to lead us into it; others fear that our sympathies will make us an easy prey to the propagandists; still others suspect that business and industry, in a blind greed for profits, may involve us in the conflict.

To give credence to such beliefs is to deny that we are normal individuals, endowed with intelligence and a will, or the ability, as a people, to profit by our own experience. In all human experience, death only is inevitable.

To say that Industry and Business want war or will encourage, directly or indirectly, our participation in the present war, is a vicious and deliberate lie.

The millions of us who, since the World War twenty-five years ago, have devoted all our efforts and energies to creating and building and improving that which we know today as American Industry and Business, are convinced that the destiny of this country can be wrought only in peace. We cannot, and *must* not, stand aside and watch even the little progress we have made since that war sacrificed to the pestilence of another world conflict. We who are trying to build a lasting heritage for those who will follow us truly know that "there never was a good war or a bad peace".

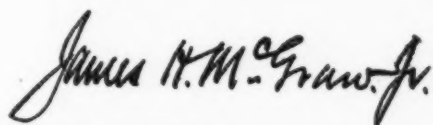
Perhaps it is time to re-emphasize two of the three elements of our democratic faith, so simply stated by Abraham Lincoln, "that government of the people, by the people, for the people, shall not perish from the earth". Now, of all times, it will be wise to inform our political stewards that government by the people and for the people must be the guiding principle in what they do during the days to come, and that it is our *will* that in our country peace shall be preserved.

Only the grim and solitary courage of each of us, the determination to exert all our intelligence, all our individual influence in every way, can insure the preservation of peace for our country.

Preparedness we know to be the most effective preventive weapon against the threat of war. We must be certain, therefore, that we provide our air, land and sea forces with the best in armaments and material, in adequate supply to maintain properly and impressively our national responsibilities and defense.

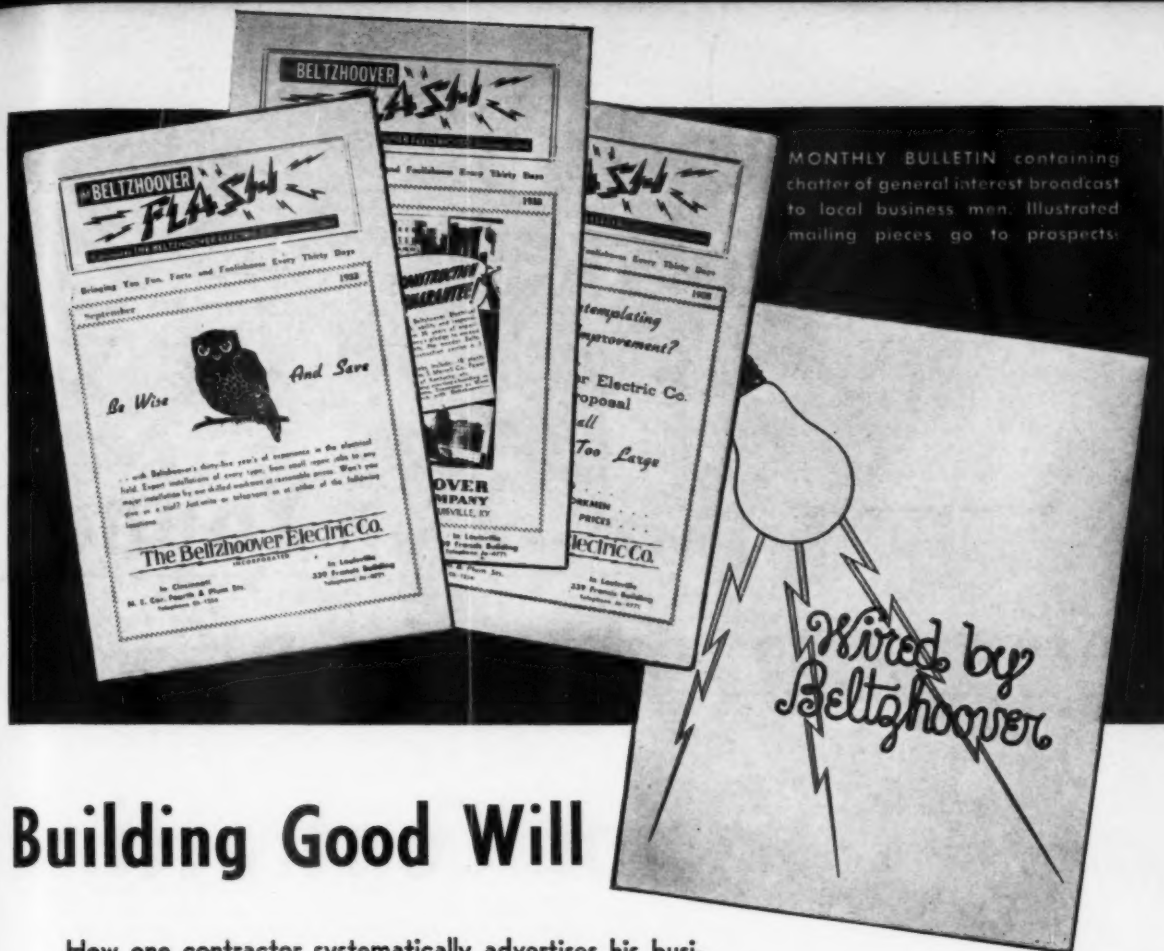
Most important is that we as individuals, thus inspired, band together to exert the full strength of Industry and Business in the maintenance of peace.

If we are to succeed, we must be forceful, we must be articulate. To that purpose we pledge ourselves and the resources of our publications. An expression from our readers will greatly assist in such a mobilization of industrial opinion. Together, in this critical time, we can serve America well!



President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.



Building Good Will

How one contractor systematically advertises his business and maintains friendly contact with his customers

SELLING cannot stop with the signing of the contract, says Charles Beltzhoover of the Beltzhoover Electric Company of Cincinnati. Beltzhoover operates an electrical contracting business in Cincinnati and Louisville, and he practices what he preaches.

Advertising and the building of cus-

tomers good will get the same consideration in the Beltzhoover organization as any other vital function of the electrical contracting business. Even though a large portion of the work carried on by the company is secured through the customary channels of competitive bidding, a comprehensive program of publicity is regularly maintained. According to Mr. Beltzhoover, the motivating principle behind their advertising and publicity work is to keep the name of the company steadily before the general public, associated with good electrical wiring. Good will is the primary motive and no immediate or direct returns are expected.

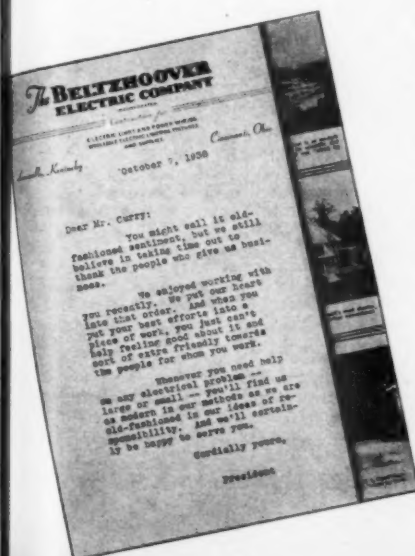
General advertising is carried through six to eight insertions a month of well planned copy in the daily newspapers. This is handled by an advertising agency which also provides the newspapers with news releases when major

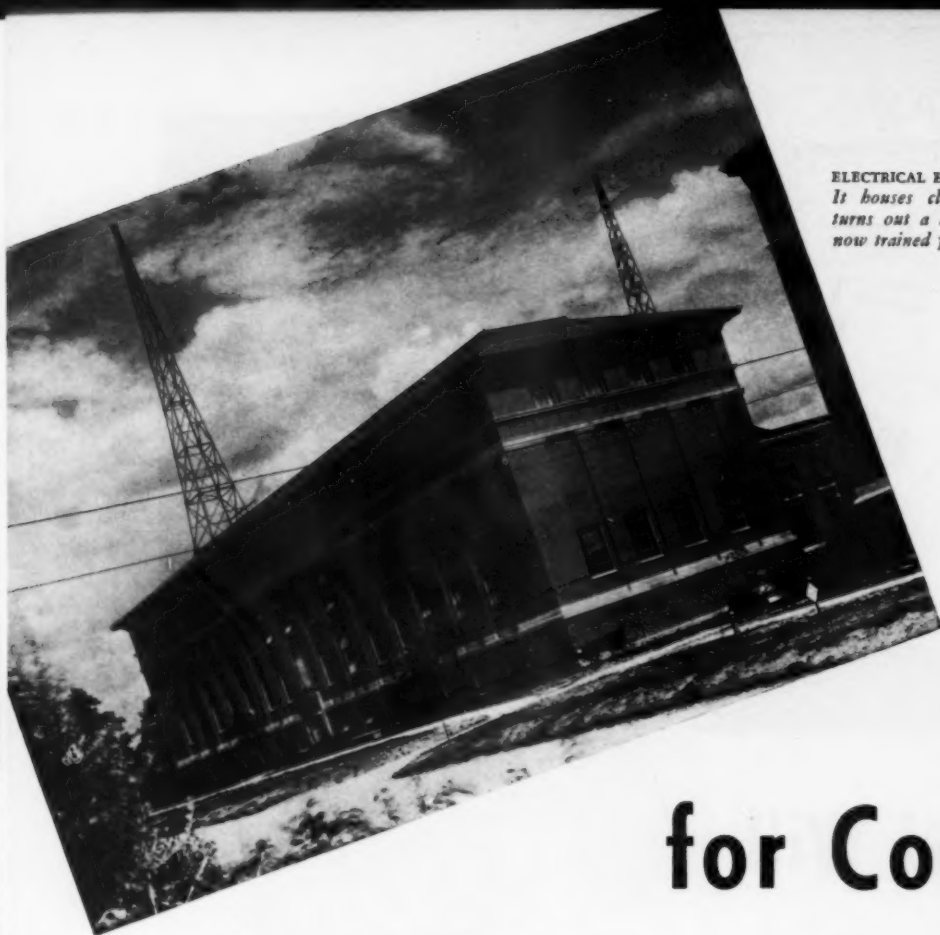
contracts are let to the Beltzhoover Company or other items of general interest to the public.

Envelope stuffers and elaborately illustrated mailing pieces are sent out regularly to architects, engineers and builders. A monthly bulletin called the "Beltzhoover Flash" containing "fun, facts and foolishness," along with short items of general interest, and a front cover advertisement for electrical wiring, is broadcast to members of service clubs, local business and professional men, and the building industry.

Then when a contract is completed comes another opportunity for adding a personal touch to customer relations. Whenever a check is received, large or small, a "thank you" note is promptly sent to the customer. This note, although following a standard form, is individually addressed and typed, and signed by the president of the company. An attractive two color folder is used with one leaf devoted to the company letterhead and the letter. The interior of the folder and the back page feature the "Wired by Beltzhoover" motto and a 5 point guarantee, together with illustrations of several outstanding wiring jobs.

A GUARANTEE—This "Thank You" letter unfolds and inside is a five point guarantee backing the Beltzhoover work.





ELECTRICAL ENGINEERING building at Purdue. It houses classrooms and laboratories and turns out a hundred EE's yearly. Some are now trained for electrical contracting.

Young Blood for Contracting

Purdue starts a course where electrical engineering students may fit themselves for a job with you. Here's what they learn and how.

By W. T. Stuart



INSTRUCTOR R. B. MARSHALL, spent several years running his own electrical contracting business. He gives students the "low-down" on problems from selecting material to labor relations.

SOME shaggy-eared engineers from Purdue, with shiny new diplomas, are looking for their opportunity in the electrical contracting field. They will fit into the routine of the contractor's business more quickly as a result of a new course in "electrical contracting" instituted at the Indiana engineering school under Instructor R. B. Marshall.

The new course was initiated to give the embryo engineers a broad picture of what the electrical construction field is and what engineers do in it. "Practical" courses are anathema in University terminology. (These are for cooperative or trade schools.) But this course gives the student some background information and training in the specific problems of the electrical contracting industry. It shows them its relation to the rest of his engineering training.

The electrical contracting class is an "elective" subject. It may be taken by students in the electrical engineering course. The class has three definite objectives according to Mr. Marshall—

"We would like to see our graduates in electrical engineering understand more of the problems so common to the contractor and his electricians," he says. "We want them to know the various devices available and in common use in the contractor's field. We want them to call these devices by their proper names. We also want our students to know the Code and know when an electrical job is done properly from the standpoint of safety and good workmanship."

"Our second objective is to develop the student's ability to write specifications and make estimates. Many engineers and contractors who thoroughly understand an enterprise may be unable to specify just what is wanted, in words that leave no chance for misunderstanding."

"The third objective is that of helping our graduates see the opportunities that lie ahead in the contracting field. I don't

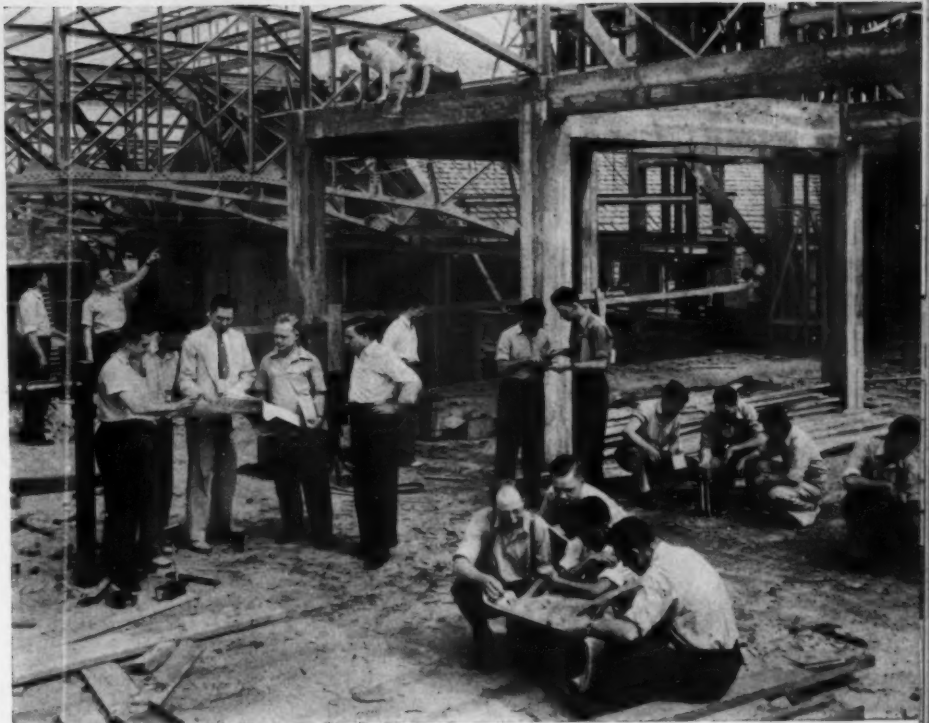
think that enough technical graduates are entering this field. I also believe that the entire electrical contracting industry can be advanced by new blood trained in electrical engineering."

The course was introduced last February at the beginning of the spring semester. The class studied catalogs of electrical devices. They learned the names of the leading electrical manufacturers and the purpose of each product. They became familiar with the common types of wiring. They studied the Code, and the hazards to property and life that might result from improper wiring.

PURDUE'S COURSE—EE-16 WHAT IT TEACHES

1. A study of the catalogs of wiring devices manufactured by leading companies. Samples are passed through the classroom daily.
2. A study of each class of wiring from the standpoint of advantages, cost, materials used, tools used, labor and code requirements. This includes knob and tube, non-metallic cable, armored cable, conduit, steel tubes, wireways, busways.
3. A study of wiring design, laying out and writing specifications for residential wiring, industrial wiring, public building wiring, underground construction, overhead construction.
4. Estimating and bidding. Blue prints are furnished to students.
5. A study of industrial control devices, circuits for push stations and automatic starters, arrangement of switches, breakers, thermal cutouts.
6. Commercial wiring; floodlights, signs and flashers, tube sign construction and installation.
7. The lessons are made more realistic by inspection trips to—
 - A residence under construction
 - A concrete building under construction
 - A modern industrial plant
 - A tube sign manufacturing plant
 - An underground tunnel system

During the semester each student laid out lighting systems, wrote specifications, made lists of materials, estimated labor cost, and prepared bids on several projects. Then, to round out



LABORATORY CLASS in electrical contracting goes out on the job, studies plans, electrical installation problems, and notes how electrical work fits in with other building trades.

the course, the class discussed labor problems and the art of successful bidding. Practical points in buying, merchandising, and financing an enterprise were introduced.

Backing all of this classroom effort, the class made a number of "laboratory" field trips to buildings under construction. These included modern industrial plants, a tube sign manufacturing plant and an underground tunnel system.

Out of a field of 100 electrical engineering graduates, 20 took the electrical contracting course. A few of these men may wind up as contractors or in the employ of contractors. Most will find their way into electrical manufacturing and utility firms.

How practical could such a course be in the cloistered halls of a University? That is best answered by pointing out that Instructor Marshall hardly needs text book references for his class room discussions. He operated his own electrical contracting business in Springfield, Ohio, from 1924 to 1928. It embraced general wiring, electrical construction, and appliance sales. Then he spent several years with a public utility, where he was in close touch with electrical construction work. From this job he went to the faculty of Pur-

due University. So being an experienced contractor, engineer and teacher, Mr. Marshall is giving his students a practical insight into the business.

The need for trained engineering minds in the electrical contracting industry can hardly be questioned. However, the average E.E. needs as much additional training after he goes to work for a contractor as any other intelligent young man.

But unfortunately he usually steps out into some other branch of the electrical industry where he can cash in on his expensive education more quickly amid more familiar surroundings. Purdue's course hopes to make it possible for the graduate engineer to earn his way up in the electrical contracting industry from the start.

The project will bear watching by industry minded men because it represents the first time an American university has recognized electrical contracting as a professional field. Whether or not these men wind up in the electrical contracting industry is at the moment less significant than the fact that Purdue will be turning out electrical engineers with some basic knowledge of the part that the electrical contractor plays in the electrical industry.

GOOD Motor Shop Housekeeping

By B. V. Ferrari
Excel Electric Service Co.
Chicago, Ill.

This progressive Chicago motor shop parallels and supports its efficient engineering and mechanical technique with records and accounting as methodically organized as the shop itself.

DID we put in new bearings when we did that rewind job for him last April?

Is there a quarter horse, split phase, 115 volt motor in stock?

How much time went into that armature undercutting job for the Jones Company?

When was the last time we had a salesman out to see the Century Machine Company?

These and dozens of other questions are daily routine in any big motor service shop. And a big chunk of that thing we call "service" depends upon how accurately we can answer them. So we have put a lot of time and thought into developing a system of records, forms



BUSINESS RECORDS are valuable. So books and records are stored away in a sturdy safe.

and paper technique that will give us the answers—now! This system breaks down under five heads—

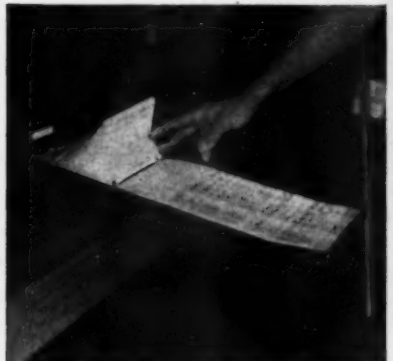
1. Sales Control—Five men in our organization handle our customer contacts and sales work. With this compact sales crew, it is unnecessary to set up an elaborate sales control plan. But—there are three things that we must know and record—

a. Who our customers and prospects are.

MODERN PLANT of the Excel Electric Service Company in Chicago, where good work is carried through into good service, by efficient organization and system.



RECORD KEEPING is reduced to the essentials and speeded up by appropriate forms.



VISIBLE INDEX card systems keep a close watch on purchases and price fluctuation.

b. Which salesman is in touch with each prospect.

c. When our salesman last called upon the prospect.

The record keeping for sales work is, therefore, simple. We use a salesman's report form which each man submits daily, stating who he called upon and what quotations were made.

Prospects are listed in a master index consisting of two card files, one "active", the other "inactive". The designation is arbitrary and simply indicates the vol-

ume of business that may be expected from the company.

Weekly sales meetings are held at which we discuss each account in the "active" file. At each meeting, a group of "inactive" cards are taken out and moved into the "active" file until they are contacted.

The master file cards note each time a salesman contacts that prospect or customer and each job performed. They provide the essential details for our sales conferences.

In contacting the customer, our salesmen usually quote repair prices and rebuilt motor prices from a standard price list.

2. Job Control—There are several things we want to know about the jobs that go through our shop—

- What materials we use and how much.
- The cost of labor.
- What repairs were made.
- When and to whom the job was delivered.

The order blank is a printed form made out in duplicate. The salesman notes the details of the job. One copy is held in the office file with the customer's purchase order attached. The other is routed to the shop superintendent.

When the motor arrives in the shop, a full description of the job is entered on five control forms—a job ticket, a time ticket, a receiving ticket in duplicate and a material ticket. These forms are made out in one operation with carbon paper.

The blue job ticket, with a separate pink material requisition form, remains in the shop. Each item of material used is noted on the material form. The work done is entered on the job ticket.

The time ticket is returned to the office. Each mechanic's time is entered on a daily time sheet and distributed over the job by order number. At the end of the day, the charges on each mechanic's time sheet are distributed over the job time ticket.

When the job is completed and costed, the job ticket is sent to the billing clerk and billed immediately. The receiving tickets are sent out with the delivery and one form is returned to the office, signed by the customer's receiving clerk.

3. Motor Sales—On every motor sale, both new and rebuilt, the characteristics are entered on a motor record card. The card is then placed in a permanent "sold stock" file. Any information the customer wants about that motor or control apparatus can be quoted at once from the file. If it comes into the shop for repairs, the file card provides us with complete data.

Loan or rental motors are recorded on a separate motor record sheet and filed under the customer's name with a standard rental agreement contract.

4. Purchase Record—We have recently also set up a purchase record file in a visible index system upon which the last price paid for any material is regularly entered. Through this system we can keep a close watch on price fluctuations in material and buy to the best advantage.

5. Accounting—In addition to these special forms and filing systems required for our business, we employ a thoroughly

sound and detailed system of bookkeeping. It lets us know, month by month, just where we stand as a business.

Our system was not set up as a unit. It evolved over a period of years seeking—

a. To place at our finger tips at all times the facts that our customers and our staff regularly need.

b. To limit to an absolute minimum the amount of non-productive and clerical

work needed to keep the records up.

Fundamentally, however, efficient paper work is so much waste motion unless shop methods, technique and service are efficient. Records can not take the place of modern machinery. So we are constantly adopting new and better methods, new materials and better machines. Efficient paper work is only part of this continuous shop progress.

1

RECEIVED OF
EXCEL ELECTRIC SERVICE COMPANY
2121-2125 S. WESTERN AVE. CHICAGO, ILL.

Your Order No. _____
Your Requisition No. _____
Sold to _____
Town and State _____
Ship by _____

2

EXCEL ELECTRIC SERVICE COMPANY
2121-2125 S. WESTERN AVENUE
CHICAGO, ILL.

3

Form No. 1
DATE SHIP _____
Your Order No. _____
Your Requisition No. _____
Sold to _____
Town and State _____
Ship by _____

4

ALL PHONES CANNOT USE
ORDER NO. & DATE _____
REQUISITION NO. _____
SHIPPED TO _____
DESTINATION _____
INVOICE DATE _____
INVOICE NO. _____

5

Form No. 2
MATERIAL REQUISITION AND ARMATURE ROTOR AND STATOR SPECIFICATIONS
CUSTOMER _____
NO. _____ MAKE _____ PHASE _____ SPEED _____ CYCLES _____ DATE _____
WIRE IN WIRE _____ NO. COILS _____ NO. WIND _____ NO. VOLT _____ NO. WIRE _____
SPIN CONNECTION _____ NO. TURNS _____ SPIN CONE _____ SIZE OF LOCK _____
QUANTITY _____
Lbs. _____ SIZE _____ MATERIAL _____
Lbs. _____ MAGNET WIRE _____
Lbs. _____ MAGNET WIRE _____
Lbs. _____ AIR DRYING MACHINERY _____
Lbs. _____ MACHINERY _____
Lbs. _____ BRASS TUBES _____
Lbs. _____ BRONZE _____
Lbs. _____

6

DAILY TIME SHEET
DATE _____
NAME _____ RATE _____
CUSTOMER _____ HOURS WORKED _____ HOURS _____ TIME RECORD _____

7

Form No. 3
ORDER BLANK
EXCEL ELECTRIC SERVICE COMPANY
2121-2125 S. WESTERN AVE.
SALESMAN _____ DATE _____
CITY ORDERED BY _____
ADDRESS _____

8

MOTOR RECORD
Date _____
IN _____ TEMP. USE _____ RENTAL _____
From _____ To _____

9

DATA
H. P. _____ Make _____ R. P. M. _____
Amp. _____ Phase _____ Cycle _____
Form _____ Frame _____ Model _____
Condition _____ Shaft _____ Key _____
Pulley _____ Belt _____ Sprocket _____
Wound _____ Poles _____ Dimension A. _____ B. _____

ACCOUNTING FORMS, that cut costs and keep records up-to-date with a minimum of pencil work. 1. delivery sheet; 2. time ticket; 3. job ticket; 4. invoice; 5. material requisition; 6. daily time sheet; 7. order blank; 8. motor record; 9. motor file card.

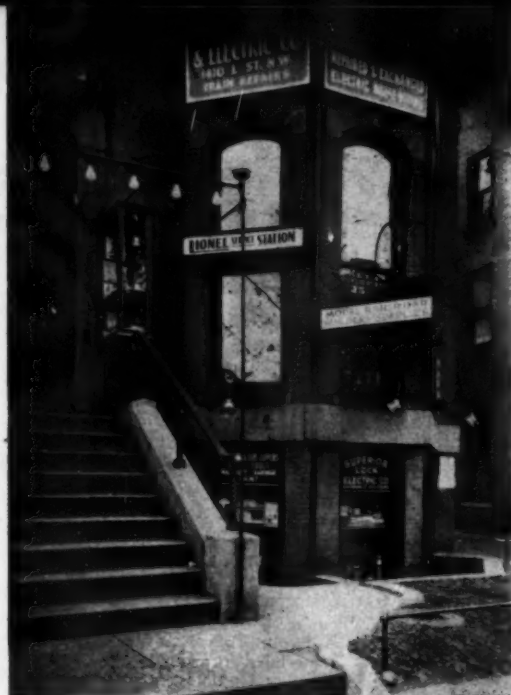
Specialties help this Contractor

SERVICE MINDED is George W. Parezo, so he bolstered contracting work by a gradual build-up of kindred business.



MODEL STOCK is for supplying train building bobbyists, who graduate from the ranks of regular factory-built equipment.

ODDS AND ENDS for drop-in service trade help to build volume all the year.



TRAIN HOSPITAL for Washington's electric toys grew into a separate department in this contractor's place of business.

A Washington contractor develops a paying business in a toy train service department

DURING the 1938 Christmas season, George W. Parezo bought \$5000 worth of electric trains and parts for the Superior Lock and Electric Company of Washington, D. C. It takes four train repairmen to handle the service work during the peak. Business starts rolling in about November first and tapers off toward the end of January. Last season there were more than a thousand repair orders.

This train repair business fits in nicely with an electrical department and a lock department. The commercial wiring and maintenance work keeps four men employed. Two locksmiths work out of the shop on emergency calls of all sorts. So this is no tinkering or simple fix-it business.

Mr. Parezo built the present volume in toy train work from a start made 28 years ago with an \$80 investment. He now builds model trains and operates official service stations for two leading



TOY SHOP where normal train repair work is handled. The pre-Christmas rush starts four service men going until mid-January.

manufacturers. Some special locomotive building orders run up to \$300. Other good business comes in for converting factory equipment to use with model trains.

This company's successful sideline suggests a way for other contractors to increase their community service contacts, and yet remain in the field of electrical work. Toy trains continue to grow in popularity, and they need expert attention. The Superior Company has made it worthwhile plus business.

25¢ A YEAR!

It costs so little
to end forever the nuisance
of blown fuses

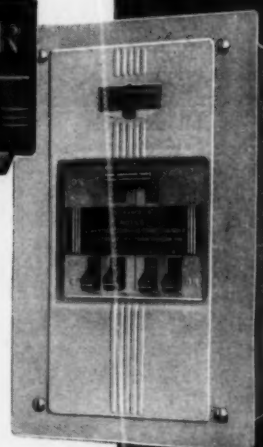
Fuses are such a nuisance. When lights go out, you fumble around in the dark, stumble downstairs, try to find those new fuses you probably forgot to buy, try to locate the one fuse that blew. It's an inconvenience you can now avoid for so little that you surely will do something about it.

The trim, convenient Cutler-Hammer Multi-Breaker actually adds less than \$5.00 to the cost of the average new home . . . 25¢ a year added to the usual new home financing payments. Think of it! Tell your architect or contractor now so your home will be truly modern with a Cutler-Hammer Multi-Breaker. Sold through recognized Cutler-Hammer wholesalers everywhere. CUTLER-HAMMER, Inc., Pioneer Electrical Manufacturers, 1306 St. Paul Avenue, Milwaukee, Wisconsin.



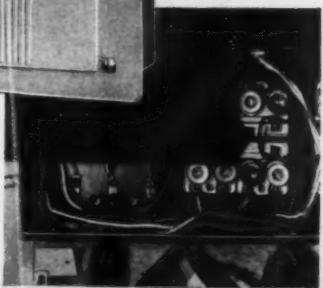
HOW THE CUTLER-HAMMER MULTI-BREAKER WORKS

The Cutler-Hammer Multi-Breaker is an attractive panel (as shown at right) located in any convenient hall or kitchen location. When an overload or short circuit occurs somewhere in the house, one of the little levers on this panel snaps into the "OFF" position. To restore service you merely reset this lever. Nothing to hunt. Nothing to replace. No live parts exposed. Simple, safe, convenient, and the first cost is the only cost.



In Old Homes, Too

The Cutler-Hammer Multi-Breaker eliminates not only the inconvenience but the unsightly tangle of wires and fuses in the cellar. Ask your electric light company or contractor for an estimate. You will be pleasantly surprised. The cost per month will probably be less than you now spend for fuses.



Millions of people, your customers, are seeing these C-H Multi-Breaker ads in National Magazines. Sales are rising steadily. Feature C-H and go to town!

HERE
you
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Editorials

Earl Whitehorne, Editor

The War And The Contractor

With death, terror and destruction unloosed in Europe, no man wants to speak of what the new war may mean to him. But he can not fail to ponder it. And so the electrical contractor in America inevitably must ask himself this necessary question: And no one sees the answer clearly.

While this plague of fear and death remains a war of European nations only, America will probably enjoy a gradually growing boom. We will be selling munitions and food to England and France. Factories will be full of workers and running over time. War demands for agricultural products will exhaust our present glutted surplus. Most of the unemployment will disappear and government relief expenditures and activities should cease with it.

With this process will come the expansion and re-equipment of factories, and the general increased repair and modernizing of commercial buildings. Growing war prosperity among our people will express itself quite naturally in housing construction and improvement and the further electrification of farms. The electrical contractor will be very busy throughout the land.

But our Government in Washington is planning for our entry into this war, perhaps in six months. They expect it to last four or five years. And though the President hopes to keep us out, all government departments are proceeding, under his direction, as though our participation in the European tragedy is certain. And when a government plans for war on such a scale, it usually happens.

If we do enter the war, because the Germans sink our ships or inflame us

in some other fashion, despite the desires of individuals and business, we will probably raise an army of 4,000,000 men, train them here and send them across the seas again to fight. That will mean an enormous further expansion of our industrial and business activities. It will mean the building of great cantonments. More billions then will flow out to all our homes and farms and make a bigger boom. Everybody will have money. And the electrical contractor will be busier than ever.

But all this is an illusion. And here lies the danger to our judgment. This excitement and activity inevitably feeds the thrill that builds up war enthusiasm and launches talk of glory.

Let no electrical man be even temporarily glad that any kind of war boom may bring dollars to his purse. For in the background of the picture stalk the shadows of another war born depression, new burdens of debt and taxation, new social and economic problems more difficult than those we have so long been struggling with. And if we fight, we add to this, the long anguish of fear and pain, of death and desolation, while our men are battling on foreign soil in somebody else's war. For this time, getting in sooner, we will suffer more sorely in our larger share of killed and maimed.

There is no reason why America should enter this war. The tribes of Europe were at each other's throats when Julius Caesar kept the peace in Gaul. They have been warring periodically across the pages of history ever since then. They will continue as long as these many highly nationalistic peoples are pent up together in this small area like worms squirming in a bait can. But their traditional incompatibility is no affair of ours. In fact, our ancestors came here to

America to escape this very thing.

We may enter this war. If we do, electrical contractors, motor shop men, plant electricians, wiremen and helpers will play their part at home and abroad. But let's face the naked truth. We will not be fighting any fight of ours to save democracy. Men have struggled up from slavery for centuries, ever seeking more freedom. They will continue to strive for liberty after Hitler, Stalin and Mussolini are gone. No, it is not our fight. We will be fighting Europe's fight to kill that mad man now misleading the German people and brutalizing that continent.

We should help the Allies with food and with munitions, in open friendship. We should defend America at any cost in blood and treasure. But we shall go across and share their battles only if we are stampeded into it. And no good will come of it to any American, boom or no boom. Therefore every American should resist the propaganda and the thrills that lure us on.

Let's not forget that. Let no electrical man become excited and shout for war. But those who knew the last World War need not be warned.

The Range is Moving

Most electrical contractors do not sell electric ranges. But it won't be long before range wiring will be important in every residence, apartment and housing project. For electric cooking is coming. Make no mistake.

If the electric range had been promoted as the electric refrigerator has been, it would be in as wide use today. It is only lack of advertising and the opposition of the gas interests that have held it back. But now the range is moving up and won't be stopped. Range wiring should be advocated in every job—ready for use.

For A Strikeless Industry

Policemen at crossings prevent many accidents. Their mere presence acts as a restraint upon the reckless driver. Just so, the Council for Industrial Relations provides assurance against strikes.

In many cities now, the local agreement between contractors and union

calls for submission of disputes to the Council before resorting to the strike. That means that both sides must put their case on paper. Often they discover this way that they have no case and the trouble is patched up.

At the recent sitting of the Council on the Charleston case, a representative of IBEW made an impressive statement. "Our aim is a strikeless industry," he said. "For after every strike one side or the other has a chip on its shoulder and that brings more trouble. Disputes settled by agreement make friends. Strikes make enemies." This sound doctrine the Council is supporting.

Good Idea Good Market

There is no romance in washing a piece of glass. Ask any housewife. That's why most lighting units are dirty. And the Revere Electric Company of Chicago has found by making tests on many gas stations that after three months, 36 per cent of the useful light is lost.

So they have staged a drive to the operators of these service stations, featuring a slogan poster reading—"Keep Floodlights Bright for Profit at Night". They furnish them to power companies who paste 'em in the gas stations somewhere and already 200,000 of them have been printed. It is a good idea this. And anybody can talk to the gas man about it and sell him better lighting if he needs it.

Progress From Within

General Electric Company paid out \$32,570, the last six months, to employees who suggested ideas for improving methods and products. In all, 5,304 suggestions were accepted within this large organization. All of them were worth it.

Are you developing the idea resources within your organization?

Hide Those Tubes

It seems as though we are drifting back to bare lamps. The vast majority of fluorescent lamp installations installed around the country during the last year are some variation of the

bare lamp idea. Exposed on ceilings and walls, with or without reflectors, lamps are often arranged in patterns, sometimes decorative but often without regard to any consideration excepting ease of installation.

But for some years we have been building up the public mind with the idea of "light conditioning," taking raw light from a lamp and by means of reflection, refraction and diffusion developing its highest efficiency for seeing. It may take 50 foot candles in potential illumination to provide 25 foot candles in useful light. But these principles are basic.

The introduction of the fluorescent lamp hasn't changed them, any more than when the novelty of the inside frosted lamp, years back, brought out a rash of bare lamp jobs. Compared with previous lamps, these were practically glareless. The same thing is now true of fluorescent lamps. But one of these days the novelty is going to wear off, and the reckoning will come.

We have taught the public to be fussy. This new and novel light source is no excuse for the industry to take a holiday from fundamental lighting principles.

Back Talk

Let Facts Rule

To The Editor—"I think you have done a splendid job in surveying and summarizing contractor opinion on the factual basis concerning the National Electrical Code changes which have been proposed by the power companies.

"Let's, by all means, rule out ill feeling and have proposals considered on a factual basis."

Wm. J. Wheeler, President
The Maintenance Company, New York

The reaction Bill Wheeler expresses seems to be general. And how could it be otherwise? These are not matters of sentiment that are involved in the Code. They are matters of fact that should be provable on an engineering basis.

Ask the Right Man

To the Editor—"I was very much interested in your editorial which appeared in the past issue of *Electrical Contracting* entitled 'Who Knows But Us?' I want to let you know that we have already carried out the thought that you suggested. I am attaching a series of five newspaper ads, which will run in our territory, which suggest that the customers see the local electrical contractor."

L. A. Falk, Manager
Dealer Cooperation Department
Wisconsin Power & Light Co., Madison

These ads which the Wisconsin Power & Light Company are running are splendid. They are telling the public with cartoons and strong arguments that there should be plenty of places to plug in lights and appliances. The loss in comfort that comes when the wiring capacity is inadequate is featured. They refer the newspaper reader to the "Local Electrical Contractor"—which is as it should be.

The Way Out

To the Editor—"Your editorial on the evils of conduit and wire protections is very much alive right now. I think that something is going to be done about it. I am enclosing a copy of our March Bulletin expressing our viewpoint. Many manufacturers told me that I have suggested the only cure."

A. J. McGivern, Managing Director
Chicago Electrical Wholesalers Ass'n.

Mr. McGivern's published recommendations are:

1. Abolish absolutely all protections on wire and conduit as they are known today.
2. When prices advance, accept no orders for deferred shipment and no orders from a customer in excess of his credit limit.
3. On monumental jobs where conditions necessitate protection to the contractor, permit him to place a legally binding order through a wholesaler for the material required on the job, to be delivered as the job progresses. This order to be equitable, not subject to change in price.
4. When contractors and wholesalers are convinced of a manufacturer's sincerity to enforce such contracts, the contractor will make up his order from his work sheets for the quantities of material required on a job. There will be no diversions to keep new business in a turmoil and such contracts will not interfere with current business. No one will be treated unfairly.

These four suggestions offer a cure. There is no doubt of it. For they make an order binding and put an end to monkey business. It would put us back on the honest basis of fair dealing, where a man's word is his bond and he says what he means. All those who want to play fair say—"Aye!"

False Protection

To the Editor—"Allow me to congratulate you on your very frank statement in your editorial in August wherein you so ably give the facts with reference to protection on contracts for wire and conduit. This is an evil that needs immediate correction. I believe that this much needed assistance to the wholesalers is important to the entire electrical industry. May the good work go on."

Leo Mayer, Contracting Engineer
Hyland Electrical Supply Co., Chicago

This comment from an old contractor, now in the wholesale business, is appreciated. And as Grover Cleveland said, "The way to commence is to commence." Or did he say "renewal". Anyhow it fits our need.

More Stalls to Clean

To the Editor—"Your editorial 'Hercules is Dead' has interested me. This is another case where an industry abuse is thrown in the contractor's lap. I recognize full well the evil of specific job protection orders, but if you will go under the surface of this practice, you will find that the contracting group are in a minority when it comes to doubling up on the quantity of the job requirements.

"Recent information has come to me that in checking a number of protection orders placed by the wholesalers, more than 80 per cent of the contractors names used were fictitious. Our Association has checked protection orders where there was question of validity several times. In each case we were in a position to secure full information."

"I want to express my appreciation of your editorial and trust you will investigate some of the other stalls in the stable. It will require a couple of rivers like Alpheus and Peneus to clean out the accumulation, but it can be done."

A. L. Stone
Executive Committeeman, Div. 9
National Electrical Contractors Ass'n.
Los Angeles.

This stall cleaning, of course, never stops but good cleaners can keep up with it. And a clean stable is better to work in. So we might as well take it seriously and do the best we can. And everybody ought to be willing to do his part. Thanks, Al Stone. We know you are.

WIRING Methods

HIGH TENSION CONDUITS

The wiring installation for flood-lighting Comiskey Field Baseball Park in Chicago, by the Henry Newgard & Co., Chicago electrical contractors, employed a high tension feeder system



SPlicing CONDUCTORS on high tension feeders for a baseball park lighting system. Pull box and conduits are painted red for identification.

from the switchboard vaults to the roof of the grandstand, distributing horizontally under the grandstand roof.

To distinguish the conduit system from all other piping and low tension circuits, pull boxes and conduits are painted a brilliant red.

APPLIANCE TESTING

To many contracting concerns, the small household appliance repair jobs that come in over the counter are handled at a loss. The cost usually exceeds the nominal charge such work will bear. Nevertheless, the service is carried for the convenience of customers.

The Allied Electric Company in Chattanooga, Tennessee, has found that with convenient testing facilities this kind of work can be handled at a profit.



FOR SMALL MOTORS—Intricate test panel provides quick test of electrical appliances.

A large test board providing alternating and direct current at a variety of voltages, current limiting circuits, short-test circuits and means of quickly measuring electrical characteristics of the appliance cut down testing time and spot trouble without dismantling.

MOUNTING PANELS

Multi-story buildings with panels on each floor directly above each other present a mounting problem. The H. P. Foley Company of Philadelphia solved this by installing two steel cables from the bottom to the top floor, with horizontal spacing wide enough to take the panel boxes. The cables were made taut with turnbuckles. The panel boxes were clamped to these cables and remained rigid while installing the feeders and building the walls.

Considerable saving in labor resulted.

VENTILATING LOCKER ROOMS

A new trick in ventilating gymnasium locker rooms is to pull the air out of the room through the lockers. This withdraws at the source the odors from the clothing stored in the lockers.

Lockers in the University of California gymnasium, at Berkeley, are



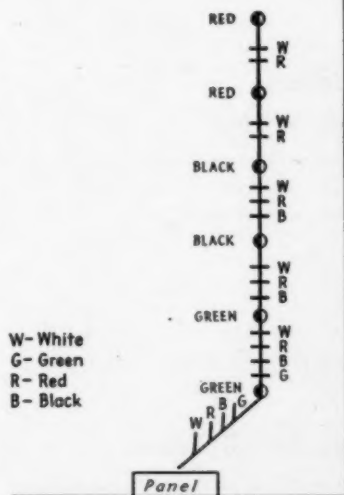
LOCKER JOB—Air is drawn from these metal lockers to prevent odors from clothing.

fitted with a double back, the chamber being used as an air duct. Main air ducts tap the lockers from the top, as shown in the picture.

Contractors can use this idea to develop ventilation business in private gymnasiums, locker rooms in factories, and other places in which worn clothing is kept. It will sell fans and wiring.

COLOR CODED PLANS

The H. P. Foley Company, in Philadelphia, uses a unique yet simple set of color coded plans on installations involving a large number of lighting circuits. Black and white prints of the layout are made. The number of wires in each conduit is indicated by the



COLOR ON THE PLANS—Colored pencils are used on black and white plans to identify color coded circuits and outlets.

A NEW... LOW COST... SMALL SIZE TRUMBULL^{TYPE} "MO" MULTI-BREAKER



Right for These Applications

- For protecting motor circuits.
- For use with additional circuits where installations have already been made.
- In homes, cottages, apartments and farm buildings, where one 2 pole or two single pole circuits are required.
- 15-20-25 ampere capacities.
- Making modern Trumbull circuit breaker protection available to new thousands of electrical contractor customers and prospects at a cost comparable with that of ordinary fused switches.

Right for These Reasons

Basically THE SAME design and construction as Trumbull "M" and "MB" Multi-Breakers.

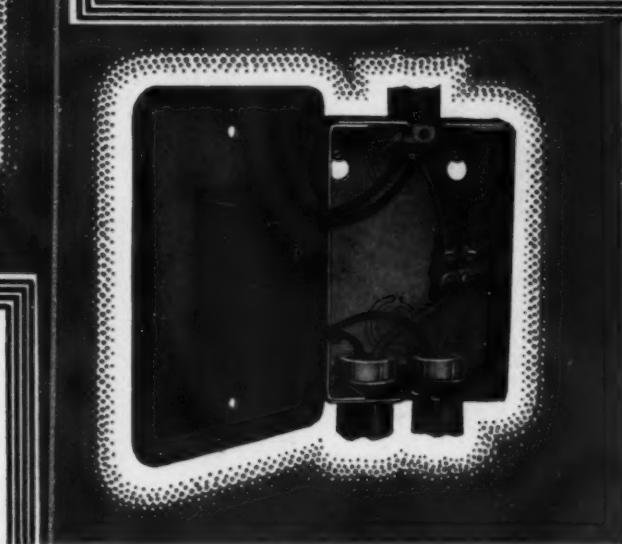
Extremely COMPACT, with entire mechanism enclosed in Textolite unit base, attached to cover.

EASY TO WIRE because cover and breaker are removable as a unit. Ample wiring space in box. Aluminized finish of inside of box facilitates inspection and wiring.

TAMPER PROOF... calibration sealed at factory, cannot be changed. Indicating handle trips free... cannot be held closed against short circuit. Breaker handles can be sealed in "off" position with wire seal, also provision for sealing cover if specified.

AVAILABLE for flush or surface mounting with insulated grounded neutral in same size compact box, with grounded neutral or no neutral.

LOW MAINTENANCE COST... nothing to replace... nothing to repair... nothing to corrode.



There's a ready and waiting market among YOUR customers and prospects for this newest addition to the Trumbull Line of Multi-Breakers. Be among the first in your territory to sell this modern, more convenient and SAFER type of protection for the purposes listed above.

THE TRUMBULL

ELECTRIC MANUFACTURING COMPANY

PLAINVILLE A NATIONAL ELECTRIC ORGANIZATION CONNECTICUT

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Plus Greater Decorative Appeal

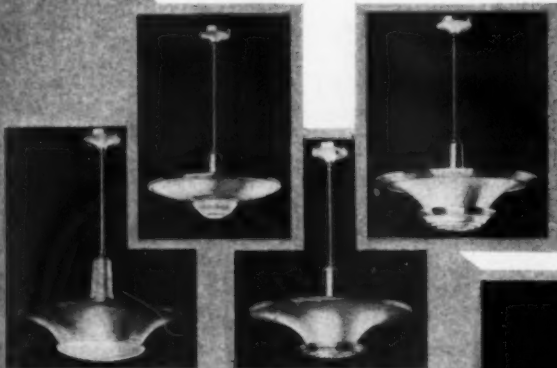
FOR COMMERCIAL INSTALLATIONS

With **ART METAL** Fixtures

(LABORATORY TESTED)

Always mindful of the need for a finer type of commercial illumination, Art Metal offers you lighting creations that combine the three essentials of good lighting . . . adequate illumination, avoidance of glare, and avoidance of too great contrast in light and dark spots . . . with simplicity of design and smart styling that make interiors more appealing. With Art Metal fixtures you can be sure of the most efficient light intensity for all the widely divergent commercial services, such as found in auditoriums, show-rooms, shops, offices, schools, libraries, banks, and clubs.

Our Engineering services are available at all times . . . We can help solve your lighting problems . . . E.T.L. curves available on request.

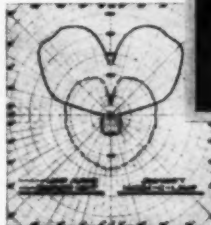


Here are shown a few outstanding items that are especially efficient and appealing in commercial use. More specialized fixtures, however, are included in the line.

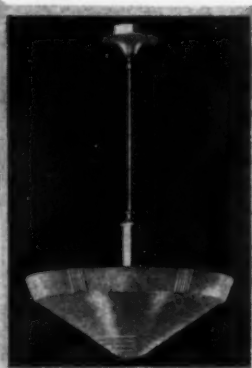
. . . and the PLASTICLITE

THE FINEST IN PLASTIC BOWL DESIGN

1. Light in weight
2. Resilient and strong
3. Reduced breakage . . . non-shatterable
4. Off-white color—the restful tone
5. Transmits light without glare — maximum surface brightness (500 W) 1.4 candles per sq. inch
6. Overall efficiency (E.T.L. test) 82.5% with baffle concealing lamp neck
7. Low maintenance cost
8. Wide light distribution
9. Extremely high output
10. Good low cost lighting
11. Molded to Art Metal specifications by G.E.



Some indication as to the effective light distribution afforded by the PLASTICLITE is shown opposite. Get details!



MAIL THIS COUPON TODAY!

THE ART METAL COMPANY, Cleveland, Ohio

Please send me free copy of Booklet C-140.

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City State EC-10-30



FREE . . .
this new commercial booklet, C-140, with complete specifications on the Art Metal line, will help you specify truly engineered illumination.



[FROM PAGE 28]

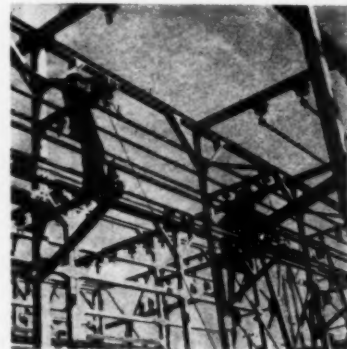
standard method. But the marks are made with colored pencils or crayons, each colored mark indicating the color of the wire to be pulled in the conduit.

Home runs to the panels have colored arrows, each arrow corresponding to the color of the circuit wire. Outlets earmarked with colors indicate the wires to which they are connected. For example, on a three phase, 4 wire lighting system the color code might be white for the grounded neutral conductor and red, black and green for the three hot legs.

By using a set of these plans a crew of men can go along pulling in the wires indicated without hesitating to decide where each one goes. A second crew can follow and connect all the outlets. This places the responsibility in the hands of the engineer and non-productive "study" time is eliminated—also, the necessity of reconnections because of incorrect circuiting.

BUS ERECTION

Tubular copper bus for outdoor substation work requires unusually careful handling in installation. Approximately 22,000 lb. of this type of bus work is being installed in a municipal substation at Memphis, Tennessee, by the Shelby Electric Company of that city.



BUS HANDLING at Memphis substation took careful installation and fast team-work.

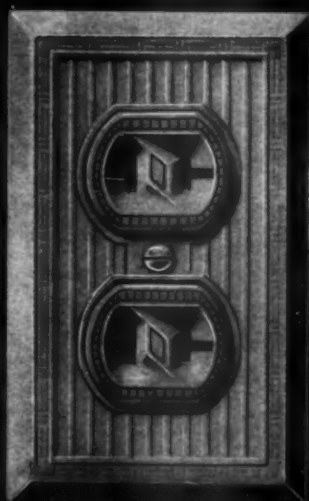
Good management and team work on the job made careful installation possible without running up excessive labor costs.

A ground crew and three men on the frame handled each 20 ft. section of bus with three hand lines. Guided into position the bus was held by the ground crew while the mechanics secured it into the bus support.

BRIGHT SPOTS IN THE WIRING PICTURE

ARROW IVORYLITE

RECEPTACLES SWITCHES UNILINE PLATES



No. 1913-I Receptacle
with No. 92101 Plate

No. 1913-I



No. 1881-I Switch
with No. 92071 Plate



No. 1881-I

FOR YOUR LIVE RESIDENTIAL FIELD



They're "Bright Spots in the Wiring Picture" — equally for home owner and Contractor. Rich, ivory-like IVORYLITE has a style-appeal so aptly in harmony with today's decorative tastes!

Structural merit backs up the style. Duplex Receptacle has full-floating contacts, adjusting automatically to alignment of the plug prongs with a firm, positive contact. Switches also have self-aligning contacts; completely enclosed Bakelite bases, compactly small for generous wiring room. Solid IVORYLITE neck and operating lever.

Switches are available in single-pole (No. 1881-I) and 3-way (No. 1883-I); listed as standard by Underwriters Laboratories; rated 10 Amps., 125V.; 5 Amps., 250 V. Plates are of standard UNILINE design with universal trade-numbers, interchangeable for all makes of devices.

The IVORYLITE Line, (brown Bakelite optional), includes Radio Outlets and multiple-gang combinations of Switches, Pilot Lights and Receptacles. All in all it's the line of today and tomorrow... be sure you have all the data on hand for properly equipping each job; ask us to see to that!

SOLD THROUGH YOUR

ARROW ELECTRIC DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

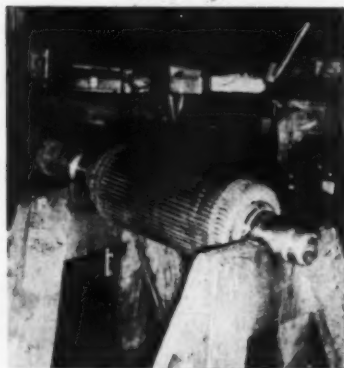
ELECTRICAL WHOLESALER

Motor Shops

SPECIAL WINDINGS

Glass insulated wire and a special slot design was required in an unusual rewind job handled by the Tennessee Armature & Electric Company of Knoxville, Tennessee.

A nearby rolling mill had a series of Schloemann motors operating through special transformers on 100 volts. They synchronize with the oper-



SPECIAL DESIGN was required to change voltage and allow for high temperatures in this rewind job.

ation of some standard voltage equipment of the same type. The rewind job involved changing the characteristics of the low voltage equipment to match that of the standard.

Unusual materials and special care in design were required because, the equipment operates at a temperature of 350 degrees. The motors are 3 to 7½ hp. with a stationary armature.

CONDENSED FORM FOR SERVICE MEN

Outside motor service calls are reported on a condensed form by the staff of Wm. C. O'Brien of Baltimore. This report gives all essential data, yet requires only a 5 by 8½-in. sheet, which is handy to use in outside work. When

WM. C. O'BRIEN
102 W. PRATT ST.
BALTIMORE, MD.

SERVICE REPORT

NAME _____

CHANGE TO _____ DATE _____

ADDRESS _____

TIME OUT _____ TIME IN _____ TOTAL _____

WORK DONE _____

MATERIAL USED _____

DEFECTS

ARMATURE _____ STATOR _____

BEARINGS _____ COMMUTATOR _____

BRUSHES _____ SWITCH _____

N. P. _____ NAME _____ NO. _____

PRICE QUOTE _____

REMARKS _____

SERVICE MAN _____

SMALL-ORDER RECORD—Outside motor service calls are handled on this condensed service report form.

service calls are completed these reports are turned in at the office for costing and billing.

These service reports provide entry spaces for customer identity, total time involved, description of work done and materials used. Defects may be noted under headings provided, and additional space is reserved for noting any additional remarks that may be necessary.

FREE-HAND ARMATURE TESTS

Before assembling small motors, reconditioned armatures are given a quick test just to avoid disassembly time in case of misconnections or grounded leads, in the small motor department of the Jacksonville (Florida) Armature Works. A wall test panel was installed near the assembly bench for this operation. On this panel are stator shells for two popular sizes of motors, both con-



QUICK TESTS—Stators on wall test board ready for quickly checking armatures before assembly.

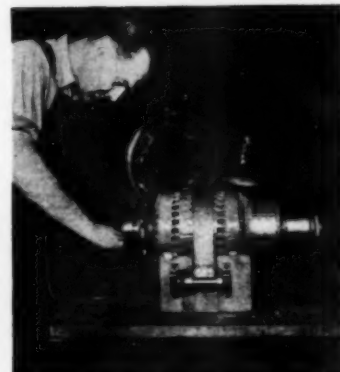
trolled by a snap switch. An ammeter and wattmeter in the supply circuit indicates any unusual armature performance.

With no end brackets or bolts to handle, this outfit permits a test mechanic to place armatures within the stator quickly. It holds the shaft ends freely for rotation adjacent to the stator's magnetic field.

A HOLDER FOR FINISHED ARMATURES

Once a d.c. armature has been reconditioned and balanced, further handling should be avoided as much as possible. Even mild bumps may injure a commutator face, damage the winding, or change the shape of a coil head enough to affect the final balance of the armature.

Assembling ball bearings on armature shafts, for example, involves the possi-



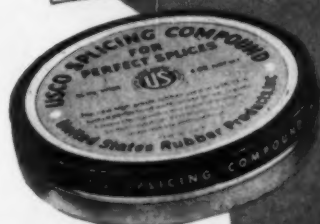
ARMATURE CINCH—Held entirely by leather, this armature stands bisected while ball bearing lock-nuts screw tight.

U.S. Tape

AND SPlicing COMPOUND

Everything you'll ever need, in friction tape and splicing compound, on any assignment. Every brand is making good for contractors because each is made good by U. S. Rubber...a name you know and trust. Stick with this leading line of tapes and compounds. It costs no more...gives you Service Beyond Price and Specifications.

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United States Rubber Company



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INSULATE ALL
CONDUCTORS**

**...with PORCELAIN
NON-METALLIC
WIRING ACCESSORIES**

by KNOX

FOR PERMANENCE, SAFETY AND ECONOMY
SPECIFY AND USE THE COMPLETELY INSU-
LATED SYSTEM. IT IS NOW AVAILABLE TO
THOSE WHO VALUE LIFE AND PROPERTY

★ CATALOG AND SAMPLES ON REQUEST

NO SHORTS • NO GROUNDS • NO CORROSION • NO ABSORPTION

**A NEW DAY
HOUSE-WIRING**

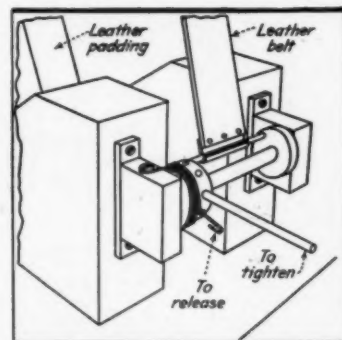
KNOX PORCELAIN CORPORATION
KNOXVILLE, TENN.

Motor Shops

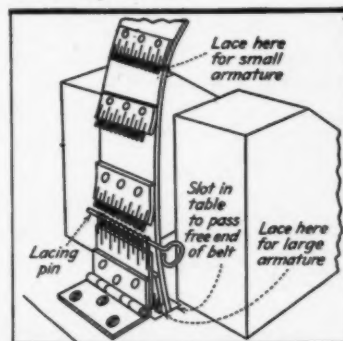
[FROM PAGE 32]

bility of inflicting injuries. It is difficult to hold an armature by hand, or to keep an armature of any appreciable size from rolling while ball bearing lock-nuts are being tightened.

As a solution to this problem the Reliance Electric & Engineering Company of Cleveland made a holder for armatures ranging in size from 7½- to 13-inches in diameter. This device consists of two wooden "V" blocks which have been padded with leather, and an adjustable-length belt which is held taut by a spring clutch. The length of the belt can be changed by moving its free end forward or back the desired amount and locking it with a steel rod inserted in the appropriate set of belt lacings with which the band is provided. The clutch wraps a spring around itself in holding



BELT TAKEUP—This clutch mechanism works through a spring and cylinder to keep belt taut.



QUICK ADJUSTMENT—Changing the belt length for different armature sizes is done with a steel pin.

down the armature and is released by lifting the free end of the spring by hand in the direction of unwrapping it.

After mounting the bearings, the armature remains strapped in the holder. The holder dolly is moved to the motor assembly line, thus a further source of possible injury to the armature is avoided.

Electrical Contracting, October 1939



"I See

three tall, slender, beautiful women . . . a blonde, a brunette, a red-head"

● Your wife is one of them. She is surrounded by Nameplates . . . on modern electrical home appliances—sweepers, mixing machines, fans, ironers, clocks—nameplates of some of the country's best known manufacturers.

Those appliances reach millions of homes through the distribution system made possible by the Electrical Wholesaler—no matter how far removed these homes be from the source of Manufacture. Through the Distributor's facilities, the manufacturer is able to place all these time and labor saving devices within easy reach of all homes—at a price far lower than otherwise would be possible.

Likewise the man who wired the home you live in relied upon his local distributor for the electrical fittings that distribute current throughout your home. He bought them at lowest possible cost because the Distributor spreads the cost of Distribution over many lines and many items, thereby reducing the Manufacturer's production and selling costs.

T & B Distributors are chosen, among other things, for the technical services they can render. T & B's entire engineering department is at their disposal. They ask for, and get, technical service for their customers. It's a *Plus* value that goes along with T & B products, at *no extra* cost. Just another way in which you benefit through the T & B Distributor Plan. In addition, he's at your beck and call, night and day. He has thousands of items made by hundreds of manufacturers under one roof—ready to give you immediately *what* you want, *when* you need it. You save money too, by buying through the T & B Distributor: he cuts your cost of doing business, and he simplifies your job of buying fittings. Make your T & B Distributor your local source of supply.

#5

A series of advertisements designed under the T&B Plan to set forth the economic reasons for the fixed T&B Distributor policy.

The **T&B** **DISTRIBUTOR**
SERVES and SAVES

**THE T & B DISTRIBUTOR
SAVES YOU MONEY BY:**

Reducing estimating costs.
Functioning as Purchasing Agent.
Delivering on schedule.
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EXPORT DEPARTMENT — BROOKLYN, NEW YORK

ELECTRICAL FITTINGS SPECIALISTS SINCE 1899

Questions Code ON THE

Answered by

F. N. M. SQUIRES

Chief Inspector New York Board of Fire Underwriters

Grounding Connections

Q. "We are required to install on all services a meter box furnished by the Utility supplying current, which is placed in the service line ahead of the service main switch and located outside of building. It is often more convenient to ground from this point than from the service switch located usually just inside building. These meter boxes are equipped with approved terminal and test blocks, also a large ground lug with approved solderless connections.

Our inspection department does not allow us to put either the neutral wire or the ground conductor under this solderless lug. Instead it requires that we use a Burndy Servit or similar connector to make up the ground connection to neutral line and leave it hanging loose and untaped in the meter box. We cannot see the advisability of doing this and it is some extra expense."—R.R.

A. The Code, in the first and second sentences of paragraph 2535, requires that the neutral conductor of the service be grounded in the service switch box. Generally the grounding conductor is then run directly out of this box to the water pipe or other grounding electrode.

However, if it is more convenient to run the grounding conductors from the service switch back through the service conduit to the meter box and thence to the grounding electrode (such as to an outside driven ground rod), the Code does not prohibit it; although the ground wire must be continuous from the service switch box to the grounding electrode and must not be broken in the meter cabinet. There should be no objection to connecting the neutral of the service to this ground wire again in the meter cabinet, if so desired; but this does not waive the requirement for the connection in the service switch box.

Disconnection For Neutral

Q. "We will greatly appreciate your simplification of the contradictory attitude of Section 2351 and Section 3801 of the 1937 Edition of the National Electrical Code. We have a 200 ampere three-wire main switch with two switch poles and two fuses with solid neutral that we wish to use as a main switch on a 115-230 volt service. What is wrong?"—L.J.H.

A. There is really no contradiction in the two rules referred to. Section 2351 General, requires that a readily accessible means of disconnection be provided for all service conductors. Section 2351C requires that where the service switch does not disconnect the grounded conductor, some other means be provided to disconnect this grounded wire from the interior wiring system.

This is generally effected by the use of a neutral strap or bus to which the service neutral, as well as the house neutral also the grounding conductor, may be attached by means of separate connections. The disconnection of the neutral is accomplished by disconnecting it from the strap.

Section 3801 requires that no switch shall disconnect the grounded conductor unless it also simultaneously disconnects the ungrounded conductor or conductors, unless the switch is so arranged that it cannot open the grounded conductor until the ungrounded conductors have first been opened. The use of a double pole, double fused switch on a three-wire grounded neutral service is permissible, provided a neutral strap or bus is provided. Spliced neutral connections at this point are not approved.

Size of Service Switch

Q. "Kindly make this question clear. According to the 1937 Code, can a 30-amp. 3-wire service entrance switch serve a fuse cabinet with 2 15-amp. lighting circuits and two 20-amp. appliance circuits?"—A. C. B.

A. No! Section 2357 is quite specific on this and says that "except by special permission 30 ampere service switches shall not be used for a two wire service supplying more than two 15-amp. branch circuits.

In the above question, we have a 15-amp. branch circuit and a 20-amp. branch circuit on each side of the three wire service and 15 plus 20 is more than 2 by 15 which equals 30.

Circuit Breaker vs. Fuse

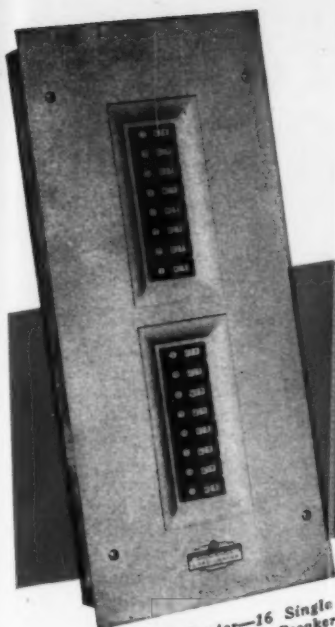
Q. "I installed a circuit breaker in a residence and a carpenter plugged his buzz saw motor into a circuit which had a 15 amp. breaker. He had a plug fuse mounted on his motor and had a 20 amp. fuse in it and on sawing claimed he blew the 20 amp. fuse out several times on heavy sawing load but the 15 amp. breaker never tripped. Does this indicate defective breaker?"—A.C.B.

A. No! This occurrence in itself does not indicate a defective circuit breaker. Such occurrences are continually taking place and have led to much confusion due to a misunderstanding of use and circuit breaker characteristics.

The 15 amp. fuse used was evidently a fuse meeting "Option A" of Under-



LOUISVILLE INSPECTOR Chief Robert E. Barry is now primed with the best in photographic equipment to promote an aggressive reinspection program. Shown photos of dangerous conditions existing on their property, owners are usually anxious to clean up, he says.

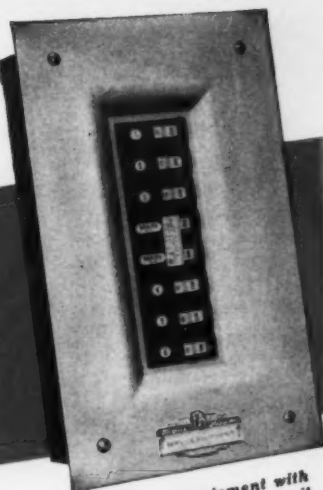


① Load Center—16 Single Pole ② AC Circuit Breaker Branch Circuits

Easy...!!..

TO CHANGE CIRCUIT CAPACITIES

If changes in branch circuit capacities are required, any ② AC Circuit Breaker can be interchanged by removing only two screws, and inserting a breaker of the desired capacity.



③ Service Equipment with D. P. 50 Amp. AC Circuit Breaker Main and 6 S. P., AC Circuit Breakers.

Contractors are Showing a Big Preference for this New ④ AC Circuit Breaker Type SERVICE EQUIPMENT AND LOAD CENTERS

Here's the popular equipment that's going over big with home owners . . . It's easy to sell—easy to install—and has many features of strong appeal:

Positive, automatic protection against short circuits and sustained overloads . . . No needless circuit interruptions when momentary overloads occur . . . No more "groping in the dark" to restore service . . . Merely return the handle to the "ON" position, after the cause of the short circuit has been removed . . . Operates manually, like an ordinary tumbler switch . . . Unusually attractive appearance . . . Fits on the job—easy to install . . . Ample wiring space . . . Priced right!

For 120 volt AC service . . . Capacities: 15, 20, 25, 35 and 50 Amp. . . . Approved by Underwriters' Laboratories . . . Send for New Bulletin No. 58 . . . Frank Adam Electric Company, St. Louis, Mo.

Stocks Near You FOR IMMEDIATE DELIVERY

With building booming as it is, one of the most important features offered by ④ is your assurance of immediate deliveries from Stock carried by your Distributor. Call him.





[FROM PAGE 34]

writers' Laboratories' specifications which is one without so called "time lag", while the circuit breaker was of the thermal type having a definite time lag.

Had the fuse been one of the time lag type (or "Option B"), it would have been a toss-up whether the fuse or the circuit breaker would have operated first.

Again, had the breaker been of the magnetic or instantaneous type or the fuse one of the time lag type, the action reported would have been reversed and the breaker would undoubtedly have operated first. But, also it should be kept in mind that had the 20 amp. fuse not been in the circuit, the 15 amp. breaker would have operated before the motor or the wires had over heated.

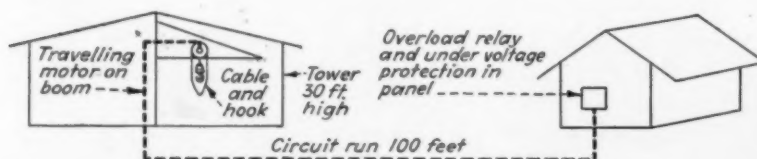
3 No. 6 Wires in 1" Conduit

Q. "Is it permissible to install 3 #6 rubber covered wires in 1" conduit for services? The Code permits this on interior wiring but there is some question as to whether or not it is permissible for services. I refer to three fully insulated #6 wires and not a bare neutral."—A.M.S.

A. The fine print note following Table 2 of Chapter 9, is part of the table and the whole table governs the size of conduit to be selected, according to the number and size of the conductors to be pulled into it. This note specifically states that, "Where a run of conduit or electric metallic tubing does not exceed 50' in length and does not contain more than the equivalent of two quarter bends from end to end, 3 #6 stranded conductors may be installed in a 1" conduit." This therefore is permissible both for service work and for interior wiring.

Motor Trouble

Q. "Recently a 3 h.p., 3 phase, 220 volt motor burned out. This is a hoist motor and is located according to the following sketch:



"Is there a definite rule or other means of knowing how many feet away from the motor the overload protection should be located? Is it possible that in this instance the overload protection to this motor is too far back on the line to fully protect the motor? Is there any difference where this protection is located to protect motor and what are the limits to watch for?"—A.C.B.

A. The location or distance away from the over current protective devices does not affect the protection afforded. The type and ratings of the protective devices should be carefully checked, as if properly selected according to the rating of the motor, they would have protected the motor from over currents.

Of course, the length of run from the service to the motor would affect the motor operation. If the wires were not of sufficient size, the long run would present sufficient resistance to effect a drop in voltage at the motor. This would cause the motor to slow down and therefore to draw an over current to perform its rated horse power.

Solid Neutral

Q. "In the case of a single phase three wire 115-230 volt service, is it allowable to use a two pole two fuse entrance switch and take the neutral wire right on through the switch enclosure to panel? This means that no connection would be made in the enclosure other than a soldered connection to the ground conductor if the ground is made in enclosure, or no connection whatever in the entrance switch box if ground is made in the meter box enclosure? We contend that a three pole solid neutral type of switch should be used, which provides a neutral bus with at least three lugs, one for line, one for line out and one for ground conductor."—R.R.

A. No. The Code in Section 2351-c requires that some means shall be provided in the service entrance switch enclosure for disconnecting the grounded service conductor from the interior wiring system. If this is not accomplished by the service switch then some other means must be provided, such as a bolted connection or a connection strip. A three pole switch with two fuses or a two pole switch and a neutral strap would be acceptable.

Grounding Refrigerators

Q. "A customer has read an article in 'Consumers' Union' a magazine put out by the Union of Consumers, regarding the grounding of refrigerators, and is upset because her refrigerator, a Kelvinator, is not grounded. I haven't seen any household refrigerators with the outside cabinet grounded (to water pipe or equal) and wish to know if it is good or necessary. If it is why do not manufacturers provide proper means for grounding?"

"The refrigerator in question seems to be sectionalized electrically with outside casing in that sides, top and front are insulated from each other by rubber gaskets. In addition the porcelain enamel should be an insulator to prevent shocks should a ground occur within the machine and reach the outside casing. This seems to leave only the door handle and hinges to be grounded.

"Yet quite recently I found a case where the metal trim on the walls of the kitchen being grounded somehow gave a path to ground from the door handle of the refrigerator. (I'll not name make). A fairly sharp shock could be felt as one opened the door and touched metal trim with elbow."—H.I.L.

A. This inquiry is very interesting and brings up a very important matter. Our correspondent did not quote the "Consumers' Union's" article but evidently they recommended the grounding of the metal parts of an electric refrigerator. Such grounding is not required by the National Electrical Code but is recommended, and the recommendation is good and should be followed for safety's sake.

As refrigerators, of the household type, are generally portable appliances, the grounding of them is governed by Code rule 2518, which, as stated above, does not make the grounding mandatory. The fine print note following 2518c says, "It is recommended that the frames of portable motors be grounded when this can readily be accomplished."

This grounding of the motor would, in most cases, also ground the rest of the metal part of the refrigerator. But if not, the same grounding means for the motor could be used for other metal parts.

While the simple grounding of the frame of the motor would eliminate probably 75 per cent of the hazard, there are, generally, other electrical connections than the motor from which the refrigerator frame may become livened. There are, generally, the lamp socket, the automatic motor switch and the general control switch and their attendant wiring. The Electrical Inspectors for years have been advocating mandatory rules for the grounding of metal frames of portable electrical appliances.

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**10,000,000
LISTENERS**

— tuned in weekly to the Westinghouse broadcast from its own theater in the heart of the New York World's Fair.



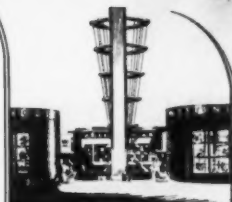
**26,000,000
READERS**

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AUDIENCE**

— will thrill to the new Westinghouse picture in glorious technicolor—"The Middleton Family at the World's Fair."



**7,965,350
VISITORS**

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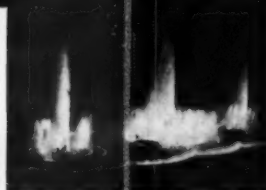
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Contractors prove WESTINGHOUSE products and WESCO Service —



The Electric Utilities Exhibit Building (N.Y.) is completely Westinghouse equipped — even to complete air conditioning.



The glorious fountain display in the Lagoon of Nations (N.Y.) is powered by Westinghouse and illuminated by 594 Westinghouse double units.



Westinghouse switchboard for 4140 volt circuit at Golden Gate. In main substation are 19 Westinghouse panels and hundreds of switches.



Westinghouse built the half-mile "Carry-Go-Round" and four electric stairways for the General Motors Exhibit, at the New York World's Fair.



U. S. Government Building (Golden Gate) contains 25 Westinghouse panelboards. Westinghouse Lamps supply all illumination.

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from one source of supply!**

The name that means everything in electricity

75 reasons

The NATION-WIDE 74 REASONS—

From Maine to California and from Canada to Mexico, WESCO branches serve electrical contractors in 74 of the major markets of the United States.

"Serve" with us means more than merely anticipating and supplying electrical needs. WESCO service includes working with and through the contractor—giving aid in selling a job—offering technical and engineering help—being a sales partner in the many problems that arise.

WESCO's solid growth reflects the pride of 2500 people in the company they represent, and their enthusiasm in the day-by-day business of cooperating with 50,000 customers.

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4. Simplified purchasing, efficient catalog and price information, engineering sales assistance.
5. Prompt and efficient deliveries—24 hour service from our 74 places to practically any other place.
6. The courteous attention of thoroughly trained people who know *their jobs!*

WESCO has — what you need — when you need it — where you need it — from one source of supply

Westinghouse

Electric Supply

NATIONAL DISTRIBUTING CORPORATION

and the

THE WESCO CATALOG

Perhaps we're exaggerating to call this catalog indispensable. But thousands of contractors have found it so.

It contains 642 pages; pictures; descriptions and prices of thousands of electrical products; thirty tables and diagrams for daily use; symbols, formulae, etc. for checking up on motors and transformers and for making wiring layouts.

If you do not have a WESCO catalog, fill out and mail the coupon on the opposite page. It will be a pleasure to send the book. No obligation on your part!



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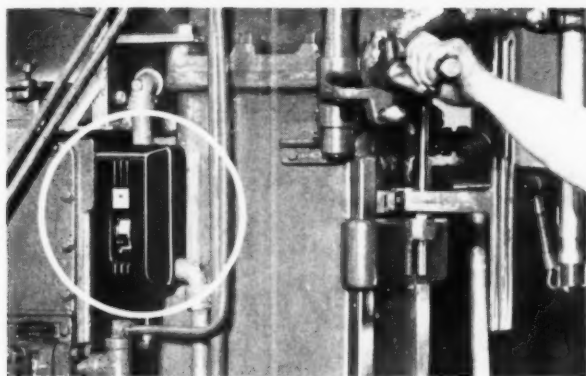
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New "De-ion" Motor Watchman CAN EASILY SAVE MANY TIMES ITS COST

Here is a new manual starter for motors up to $7\frac{1}{2}$ hp. It has a bi-metal disc relay that gives accurate overload protection even after repeated operation. In case of overload, it immediately cuts the motor from the line preventing damage to windings. Can easily save many times its cost in motor repair bills.

NOTE THESE FEATURES:

- Hand operated, self indicating toggle switch.
- Safety interlock prevents accidental contact with live parts.
- "De-ion" Arc Quenchers
- prevent flashovers, prolong contact life.
- Easy to wire and mount . . . knockout space in top, sides, bottom and back of case.



LOOK FOR THIS
TRADE-MARK

See your nearest Westinghouse Distributor

Ask your nearest Westinghouse distributor for sizes, types and prices . . . push buttons, switches, control, motors and electrical apparatus.

J-20827



NOFUZE CIRCUIT BREAKER saves clay plant \$18.00 A DAY

The man who recommended NOFUZE Circuit Breakers to a Western clay plant saved this plant \$18.00 a day in losses due to fuse outages. Naturally he made a permanent customer for himself. For your customers bothered with losses due to fuse outages, recommend the Westinghouse Nofuze Circuit Breaker.

Westinghouse Combination Linestarter



This combination builds you up with your customers. Shows them how to get all necessary devices in the motor circuit in one compact and money saving installation. It provides:

- magnetic motor starter (push button operated).
- manual disconnect switch.
- motor overload protection.
- Nofuze circuit protection.

It is all available for the cost of ONE installation.

Packaged Control

Distributed by **WESTINGHOUSE ELECTRIC SUPPLY CO.** BRANCHES ON LAST INSERT PAGE

Westinghouse

MAZDA LAMPS

for every lighting job!

Wherever there is a need for general or special lighting, there is a Westinghouse Mazda Lamp to produce desired results with true efficiency and economy. Use and specify these quality lamps. Like other Westinghouse products, they are made according to precise, exacting standards. They are uniform, thrifty, dependable — as fine as half a century of experience can make them.



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THE "MID" YEARS 1900-1910 THE "MID" YEARS 1910-1920 THE "MID" YEARS 1920-1930

Daylight at any hour... with FLUORESCENT LUMINAIRES

that build up...

NEW Profits! NEW Customers!

Here is science's rival to daylight... with an extended light source for wide industrial applications. Here is far greater efficiency than any other kind of illumination for interior lighting. Here is low brightness for minimum glare. Here is a 50 per cent cooler light than any incandescent source... and unusually long life. It is your big opportunity to make lighting business pay real dividends.

All 48-inch units for 40-watt lamps are available in one or two lamp fixtures with spread or concentrating reflectors. Reflectors are finished by the Alzak Process for greater permanence and easier maintenance.

All-steel housings are welded at both ends to eliminate dust and dirt. They are finished in an easily cleaned, 2-coat synthetic enamel.

For the first time, industrial plants and other users demanding color corrections may have accurate color rendition without heavy light loss through filters. Where materials must be matched in tone, Fluorescent units will be found the correct type of illumination. All Westinghouse Fluorescent units are equipped with suppressors to eliminate radio interference.

For full details call your local Westinghouse distributor, or address Westinghouse Electric & Manufacturing Company, Lighting Division, Edgewater Park, Cleveland, Ohio.



TWO-LAMP FLUORESCENT REFLECTOR



ONE-LAMP FLUORESCENT REFLECTOR

EXCLUSIVE LOCKLITE PRINCIPLE

For ideal general plant illumination, Westinghouse provides the exclusive Locklite Reflector line for incandescent lamps. This new connecting principle cuts maintenance costs... is safer... gives complete interchangeability of seven reflector types. Locklite lights as it locks. More and more customers are asking about Locklite. Be prepared to tell them the story of this new money-saving Westinghouse line.



Westinghouse

Lighting Equipment



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Then "FAIR" YEARS into PROFIT YEARS with WESCO

HOW BILL JONES BOULDS HIS BUSINESS (AND PROFITS)



THAT FELLOW'S DOING A SWELL WIRING JOB FOR YOU, WILSON



YOU BET! WHEN A CONTRACTOR RECOMMENDS AND USES QUALITY WIRING DEVICES LIKE **BRYANT**, YOU CAN BE PRETTY SURE HE'S FIRST CLASS

HELLO, JONES? I LIKED THE JOB YOU DID FOR WILSON. SEE ME TOMORROW ABOUT A JOB I'VE GOT.



NEXT MONTH

BILL JONES SAYS.....



THERE'S NO BETTER PROFIT TEAM THAN QUALITY WORKMANSHIP AND QUALITY MATERIALS!

BRYANT and HEMCO SUPERIOR WIRING DEVICES ARE PROFIT PARTNERS TO ELECTRICAL CONTRACTORS



● The name Bryant or Hemco on any wiring device is recognized throughout the electrical industry as a mark of precision and quality. It is a reputation of more than half a century's standing, and a very definite *plus* advantage to every electrical contractor who uses and specifies Bryant devices.

SOLD THROUGH ELECTRICAL WHOLESALERS

EVERY OUTLET DESERVES A BRYANT DEVICE









THE BRYANT ELECTRIC COMPANY • BRIDGEPORT, CONNECTICUT
 NEW YORK: 101 Park Avenue • CHICAGO: 844 West Adams Street • SAN FRANCISCO: 325 Ninth Street
 LOS ANGELES: 420 South San Pedro Street

Distributed by **WESTINGHOUSE ELECTRIC SUPPLY CO.** BRANCHES ON LAST INSERT PAGE

THAT "PAID" YEARS INTO PROFIT YEARS WITH WESCO



BERMICO *increases your Profit*

Speedy conduit installation reduces labor costs... increases your profit on the job. So it's just plain good business to use a proven time-saver like Bermico. The natural light weight of this sturdy fibre conduit makes handling easy and speeds laying-up in the trench. Special Bermico non-split coupling eliminates time losses incurred in replacing broken couplings. Every joint is quick-fitting, water-tight. Strong virgin wood fibre imparts the toughness to resist shocks, blows and

rough handling. Bermico Fibre Conduit passes all underwriters' tests of fibre conduit for use with concrete encasement. Use Bermico to speed up your next job and increase your profit. Brown Company, 120 Lexington Ave., New York, N. Y.

WHY THIS NEW COUPLING CAN'T SPLIT

Driving forces tapered conduit ends solidly against fillet in center of coupling. Pressure is held on direct line through fillet. Ends cannot wedge and press outward to split the coupling.





BERMICO *fibre* CONDUIT

A durable protective raceway for underground cables. Easy to install. High mechanical strength. Low water absorption. Acid resistant.
MADE WITH VIRGIN WOOD FIBRE.

* REG. TRADE MARK

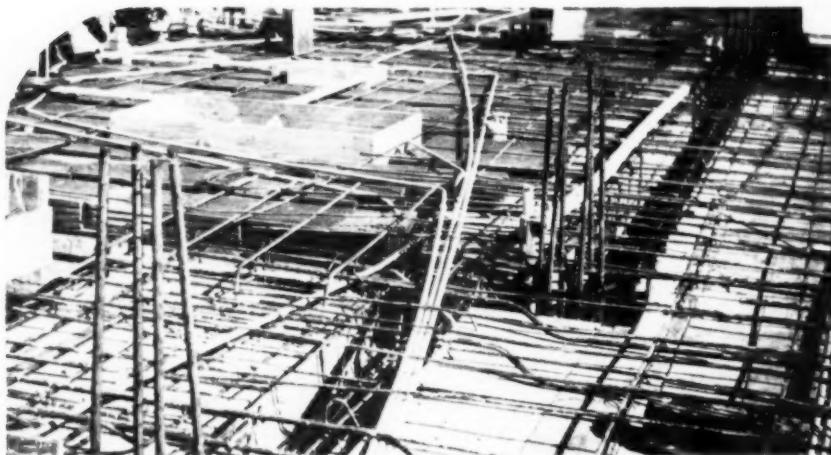
**A CELLULOSE PRODUCT OF
BROWN COMPANY**

QUALITY

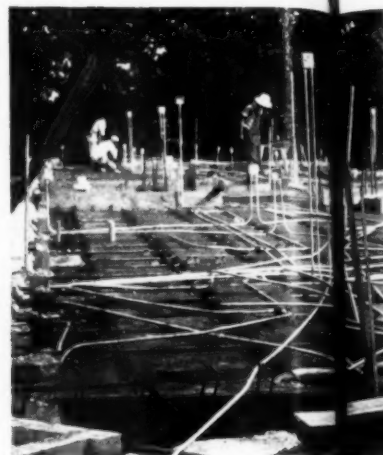

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Then "FAID" YEARS into PROFIT YEARS with WESCO

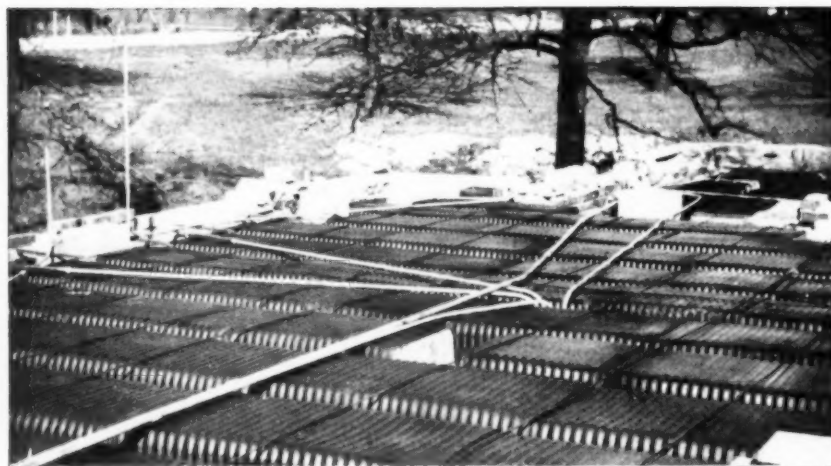
Long runs, such as shown in this photo of the St. Agnes Old Folks Home, Kirkwood, Mo., wired in 35,000 feet of ELECTRUNITE Steeltubes by Carl Schaeffer Electric Co., are easily made. With Steeltubes, it's not necessary to turn the entire line.



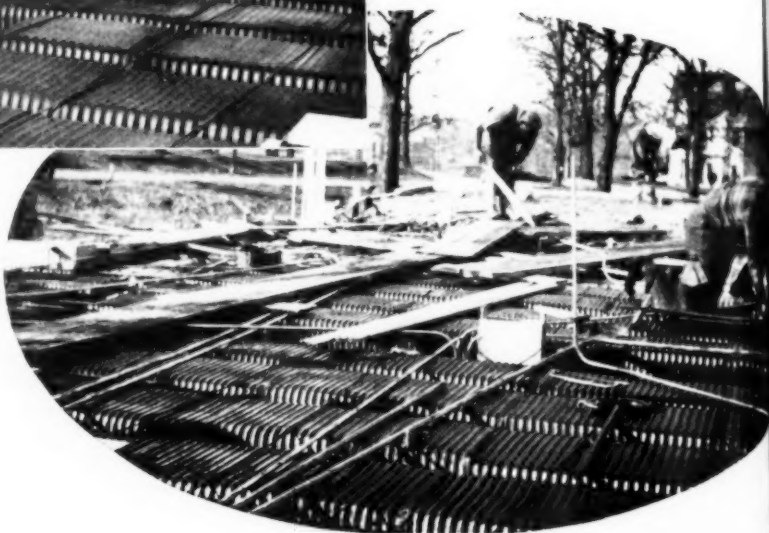
Another view of ELECTRUNITE Steeltubes at the St. Agnes Old Folks Home. Notice the accuracy — because ELECTRUNITE Steeltubes are made without distortion.



You can Save Money— STEELTUBES



The larger modern residences are swinging to concrete construction, as shown in these photos of a residence in St. Louis, Mo. Such structures need sound wiring equally as much as do large commercial buildings — and they need it at an economical price. That's why the W. C. Burton Electric Co. used ELECTRUNITE Steeltubes in wiring this job. Steeltubes is available in seven sizes to provide for all types of construction — large or small.



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TURN "FAID" YEARS into PROFIT YEARS with WESCO

UMI

ELECTRUNITE Steeltubes used in the St. Agnes Old the m... Every one is uniform and ELECTRUNITE bends freely and accurately

The Carl Schaeffer Electric Co. used 6,000 feet of ELECTRUNITE Steeltubes in installing the electrical system for this office building. Look at those runs. They are light and easy to handle — but they're tough, strong, open-hearth steel.



...in two ways—by using ELECTRUNITE STEELTUBES IN CONCRETE!

● **ELECTRUNITE** Steeltubes provides sound, safe, steel protection for electrical wiring in concrete—and, best of all, it is economical—it saves money.

FIRST—This modern threadless rigid conduit, with all necessary fittings included, costs less, in most areas, than old-style conduit.

SECOND—**ELECTRUNITE** Steeltubes, because of its ease of handling, bending, cutting, coupling together and wiring, costs less to install. Especially is this true on concrete jobs where there are many narrow, cramped spaces in which to work.

Use **ELECTRUNITE** Steeltubes on your next job—in concrete or exposed. Then figure the difference in cost—and in profit.

Look for this label. It is found only on genuine **ELECTRUNITE** Steeltubes.



Many contractors find that the new Hossfeld Bender saves money, too. It makes full, round, smooth bends easily, quickly and without flattening or wrinkling. On one job alone it enabled the contractor to save the cost of 1,000 factory elbows and 1,500 couplings. Ask your Steeltubes salesman for complete information.

Steel and Tubes, Inc.

CLEVELAND OHIO

SUBSIDIARY: REPUBLIC STEEL CORPORATION

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Turn "FAIR" YEARS into PROFIT YEARS with WESCO

DAYLIGHTING WITH DayBrite

Fluorescent Lamp Fixtures *Puts Added Sales Punch Into Display Case Lighting*

Alert merchandisers are turning to Fluorescents for display case lighting as the one light source that has everything . . . true day-light color . . . continuous, spotless illumination . . . low heat . . . and high efficiency.

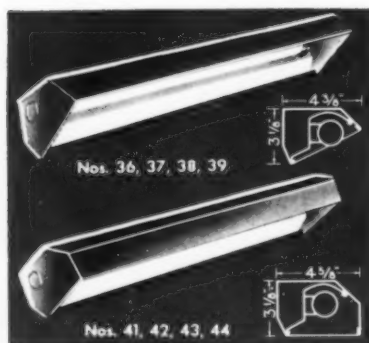
With Day-Brite fixtures you are assured of all these advantages because Day-Brite gives you the benefits of extensive research and engineering. It is recognized as the leading line of Fluorescent fixtures in the field today.

Day-Brite Will Help You Get This Business

You will find numerous opportunities for new and profitable business if you have all the correct information on the many possible uses for Fluorescents.

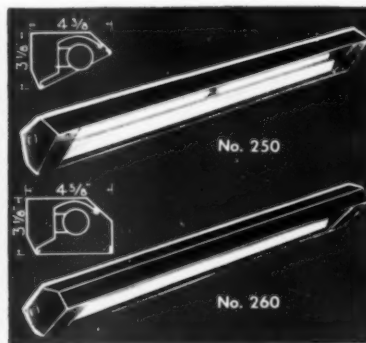
Day-Brite offers you this valuable information in Catalog No. 110 showing our complete line of correctly engineered Fluorescent fixtures. It tells you of the superior design features, increased efficiency and ease of installation of Day-Brite fixtures.

Write for Catalog No. 110 today—It will bring you more business and more profits. The use of Day-Brite fixtures will assure many satisfied customers.

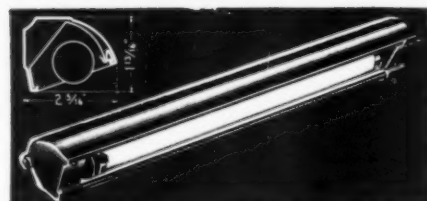


One-Light Unwired
Wallcase Units

For 18", 24", 36" and 48", T-8 or T-12 Fluorescent Lamps



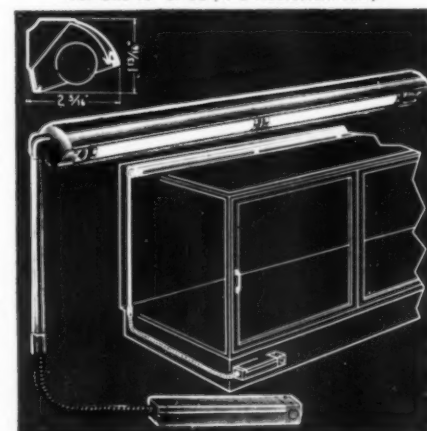
Continuous Wired
Wallcase Troughs



No. 140 Series - Unwired Showcase Units
For One 18" or 36", T-8 Fluorescent Lamp

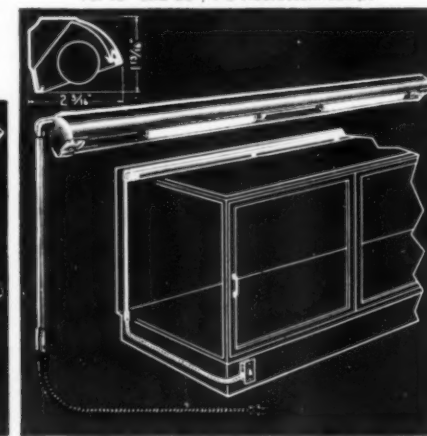


No. 140X Series - Wired Showcase Units
With Built-In Auxiliaries
For One 18" or 36", T-8 Fluorescent Lamp



No. 1400 Series - Continuous Showcase
Fixtures

With Auxiliaries Mounted in Base of Case
For 18" and 36", T-8 Fluorescent Lamps



No. 1400X Series - Continuous Showcase
Fixtures

With Built-In Auxiliaries
For 18" and 36", T-8 Fluorescent Lamps

Day-Brite Lighting, Inc.,

5401 Bulwer Ave.

St. Louis, Missouri

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Turn "FAIR" YEARS into PROFIT YEARS with WESCO



*If circuits are being
shut down needlessly—*

BUSS Fuses May Solve Your Problem

Shutdowns, caused by the needless opening of protective devices, have been accepted by many executives as a penalty imposed upon them to obtain safe electrical protection.

But why should shutdowns that cost so much in time and money be accepted as a necessary evil, when—as far as fuses are concerned—they can be practically wiped out.

If you are suffering from such shutdowns—and somebody blames them on fuses—that's the time to do some careful checking.

Chances are that BUSS Super-Lag fuses will solve your problems.



BUSS Fuse-Cases are so made that they prevent the development of poor contact within the fuse. This eliminates heating that destroys fuses and causes them to blow needlessly.



BUSS Fuse-Links have a super long time-lag that permits them to hold without blowing when harmless overloads occur. This means they will not pop out needlessly because of heavy starting conditions, or due to two or more motors starting simultaneously, or machines being momentarily stalled, or similar conditions that cause harmless or momentary overloads.

**Get your copy of the book—
"How to Select Renewable Fuses"**

Write for a free copy. You will find it unusually interesting as it compares the various types of fuse construction, and shows how the BUSS fuse is made to protect—but not to blow needlessly.

BUSSMANN MFG. CO.
University at Jefferson, St. Louis
Division McGraw Electric Company

BUSS Super-Lag fuses help eliminate these two greatest causes of protective devices opening needlessly.



BUSS super-lag **FUSES**

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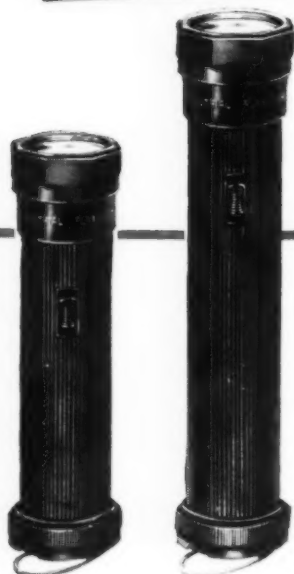
Three "PAID" YEARS into PROFIT YEARS with WESCO

Special Jobs Require Special Tools

...and there's a special

"EVEREADY" FLASHLIGHT

For Every Industrial Need



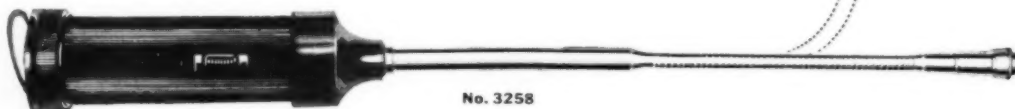
No. 3251

No. 3351

No single tool can meet *every* requirement. But, the three "Eveready" flashlights shown here ... each a champion in its class ... can be depended on to do a good, safe, economical job under almost every conceivable condition.

Flashlights 3251 and 3351 are for general purpose *industrial* use. They are cased in semi-hard rubber ... are unaffected by water, oil, gasoline, alcohol, acids or dropping impact ... have hand replaceable switches and unbreakable lenses.

Flexible Extension Flashlight 3258 is a wizard where ordinary lights fail. Its easily manipulated "giraffe" neck puts light *where you need it* ... inside tricky electrical equipment, sounding pipes, barrels and drums. Helps to keep your hand at a safe distance from moving machinery. Semi-hard rubber barrel and end-fittings ... gives long service and takes hard knocks.



No. 3258

NATIONAL CARBON COMPANY, INC.

General Offices: New York, N. Y.—Branches: Chicago, San Francisco

Unit of Union Carbide  and Carbon Corporation

The word "Eveready" is a registered trade-mark of National Carbon Co., Inc.

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Turn "FAIR" YEARS into PROFIT YEARS with WESCO



Says W. T. FOLEY:

(Third from right in photo)

"It is a pleasure to sell Ilg equipment, since it is a nationally advertised, quality line. As you know, we have been selling the Ilg line for about nine years. . . We like the co-operation we receive from your office as well as the prompt deliveries from your distributor's stock. . . We have no service worries when we sell Ilg equipment, and another feature we like is the price policy of the Ilg company."



VENTILATION
and Air Conditioning

ILG ELECTRIC VENTILATING CO.
2879 NORTH CRAWFORD AVENUE . . . CHICAGO, ILLINOIS

FOLEY AWARDED \$100.00 PRIZE FOR BEST ILG WINDOW

● Every dealer who displays the Ilg line of electrical ventilating and cooling equipment wins increased business and greater profits. Universally known by name and performance, nationally advertised, backed by the one name plate guarantee of a pioneer manufacturer. . . Ilg Electric Ventilators and Cooling Fans lead the field in public acceptance.

In a recent contest, sponsored by Ilg, The W. T. Foley Electric Co., Kansas City, Kan., took first honors for its show window display. The competition was conducted nationally to promote local identification of Ilg products at the point of purchase.

The W. T. Foley Electric Company is one of the many concerns that is making money on its tie-up with the Ilg sales promotion program. You can do it too! Ask for a free copy of the new, illustrated, Condensed Catalog showing the full Ilg line and get complete information on Ilg's attractive dealer policy, including trade discounts, merchandising co-operation, etc. Write at once. No obligation.

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SHERMAN WIRE CONNECTORS

WE WIRE LIKE THAT
WE WANT THE BEST
LOW COST INSTALLATIONS

GET SHERMAN PRODUCTS
FROM ANY WESTINGHOUSE BRANCH

SPlicing SLEEVES



Split Tinned



SO Type
SOLDERLESS LUGS



Heavy Duty
SOLDERING LUGS



SM Type
SOLDERLESS LUGS



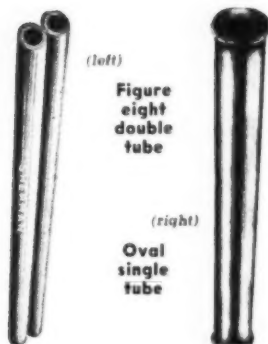
Side Formed
SOLDERING LUGS



SET SCREW CONNECTORS



RIGID GROUND FITTINGS



(left)

Figure
eight
double
tube

(right)

Oval
single
tube



SPLIT BOLT CONNECTORS



Bakelite
FIXTURE CONNECTORS



Bronze



CONNECTORS



WEDGE-GRIP CONNECTORS

H. B. SHERMAN MFG. CO., BATTLE CREEK, MICH.

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SERVICE FREE PARAGON TIME SWITCHES

**COMBINING LOWEST LIST PRICES
AND LONGEST, TROUBLE-FREE LIFE**

Contractors who install PARAGON TIME SWITCHES for controlling store lights, window lights, flood lights, signs, ventilating and heating systems or periodic industrial operations, will profit three—no, four—ways:

1st;—They offer the lowest list prices of any standard synchronous time controls—meaning more and easier customer sales.

2nd;—Paragons are the easiest and simplest time switches to install and adjust—thus lowering installation costs—greatly.

3rd;—They enjoy the longest life—free of profit-eating service calls—due to their sturdy slow speed industrial type motor and construction.

Since the introduction of these new Paragon Models, last November, NOT ONE has been returned for electrical or mechanical defect or breakdown.

4th;—The unequalled customer satisfaction in the dependable service rendered by your PARAGON installation pays you unmeasurable profits.

PARAGON TIME SWITCHES are all designed, built and guaranteed by the largest exclusive manufacturers of Electrical Time Control Instruments.



Paragon "300" Series lead in low cost instruments for controlling up to 4 operations daily. Detailed in Bulletin 3965 E.

**PARAGON
301
SINGLE POLE
SINGLE THROW**

**\$1.30⁰⁰
LIST**



Paragon "G"
Series — unquestionably the finest time controls at any price. Designed to handle varying operations up to 6 daily. Priced from \$18.50 up. Ask for Bulletin 3860 E.

PARAGON ELECTRIC COMPANY
7 West Van Buren Street
CHICAGO, ILL.

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Sterling Reflectors

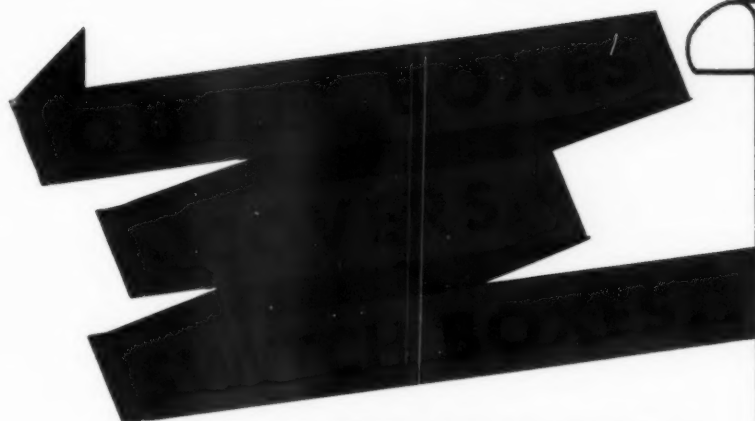


Made for Every Requirement-- Catalog on Request

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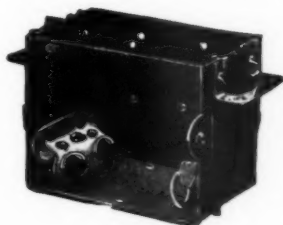


"PAID" YEARS - 1 - PROFIT YEARS - 1 - WESTINGHOUSE

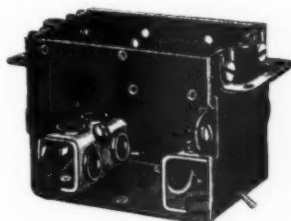


by **STEEL CITY!**

Economy! Safety! Convenience! Permanence!



LX



STAR LXC

Money-Saving Features are built into all Steel City products and Electrical Contractors everywhere are daily saving themselves time and money by using this complete up to the minute line of wiring materials. When you insist on getting Steel City products from your wholesaler you know you are buying the best that can be had and something that is backed up by forty years of manufacturing and engineering experience.

Steel City Outlet Boxes, Covers, Switch Boxes and other commodities are specified in jobs that call for careful, far-sighted planning. Economy makes them desirable from the standpoints of both present and future costs. Safety features protect men and equipment. Convenience of installation provide outlets where you want them . . . when you want them. Permanence and adaptability help you to meet unexpected demands and emergency situations.

Steel City Products are built to give—

Everlastingly
Satisfactory service

Contractors find that they help to get new business . . . and build repeat business. Users find them absolutely dependable. To increase your profits — specify Steel City Products. Write for estimating catalog.



36151X



58361



58CT



58C30



4G and 4GC



494 AC



No. 2 Allen Bender



No. 4 Allen

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Turn "FAIR" YEARS into PROFIT YEARS with WESCO

Stocks of PENN-UNION Conductor Fittings carried by

Westinghouse

Electric Supply Company Branches

The utmost in Convenience and Quick Delivery, for all users of Conductor Fittings... Here are just a few of the more than 6,200 items in the PENN-UNION line.



You know that it's Dependable when it's a Penn-Union fitting. Every item carefully designed, thoroughly tested. Preferred by leading utilities and "industrials" for their Modernness... Time-Saving features... Uniform High Quality.

PENN-UNION ELECTRIC CORPORATION—Erie, Pa.

PENN-UNION

The COMPLETE Line of Conductor Fittings

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Turn "FAIR" YEARS into PROFIT YEARS with WESCO



★
**Through EVERY FOOT of
 Youngstown Buckeye Conduit**

Youngstown Buckeye Conduit has a high speed, high profit raceway. When Buckeye Conduit is bent, the mirror-smooth lacquer lining sticks to the pipe -- flexible yet tough -- no flakes, no wrinkles. Your fish wire can take these corners at high speed and keep right on going -- that's what saves your time and money.

Youngstown, the largest producer of conduit in America, can afford to make Buckeye Conduit as a specialty. Fine equipment and accurate production at Youngstown are justified by this fact --- you get a better product at no increase in cost.

For your next job, buy Buckeye -- and get conduit that works *with* you. Watch your men push that schedule. You'll be through on time, with more money in your pocket.



Conduit - Pipe and Tubular Products - Sheets - Plates -
 Tin Plate - Bars - Rods - Wire - Nails - Tie Plates and
 Spikes.

26-12B

Manufacturers of Carbon and Alloy Steels
 General Offices YOUNGSTOWN, OHIO

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ON THE MAP... to serve you!



ALBANY, N. Y.	Westinghouse Electric Supply Co. 4-9135
ALLEN TOWN, PA.	Westinghouse Electric Supply Co. 5105
ATLANTA, GA.	Westinghouse Electric Supply Co. WALNUT 5806
AUGUSTA, ME.	Wetmore Savage Div. 2040
BALTIMORE, MD.	Westinghouse Electric Supply Co. PLAZA 0300
BANGOR, ME.	Wetmore Savage Div. 6487
BINGHAMTON, N. Y.	Westinghouse Electric Supply Co. 4-1364
BOSTON, MASS.	Wetmore Savage Div. HANCOCK 7800
BURLINGTON, VT.	Wetmore Savage Div. 1924
BUTTE, MONT.	Westinghouse Electric Supply Co. 2-1269
CHARLOTTE, N. C.	Westinghouse Electric Supply Co. 2-3105
CHICAGO, ILL.	Westinghouse Electric Supply Co. HAYMARKET 2540
CLEVELAND, OHIO	Westinghouse Electric Supply Co. HENDERSON 6000
COLUMBIA, S. C.	Westinghouse Electric Supply Co. 8145
DALLAS, TEXAS	Westinghouse Electric Supply Co. 2-2401
DES MOINES, IOWA	Westinghouse Electric Supply Co. 4-8134
DETROIT, MICH.	Westinghouse Electric Supply Co. MADISON 8450
DULUTH, MINN.	Westinghouse Electric Supply Co. MELROSE 2324
VANSVILLE, IND.	Westinghouse Electric Supply Co. 7276
LINT, MICH.	Westinghouse Electric Supply Co. 2-9149

FORT WAYNE, IND.	Westinghouse Electric Supply Co. HARRISON 4349
FORT WORTH, TEXAS	Westinghouse Electric Supply Co. 2-1107
GRAND RAPIDS, MICH.	Westinghouse Electric Supply Co. 9-3105
GREENVILLE, S. C.	Westinghouse Electric Supply Co. 3930
HOUSTON, TEXAS	Westinghouse Electric Supply Co. CAPITOL 7272
INDIANAPOLIS, IND.	Westinghouse Electric Supply Co. MARKET 3301
JACKSONVILLE, FLA.	Westinghouse Electric Supply Co. 5-7246
LOS ANGELES, CAL.	Westinghouse Electric Supply Co. VANDIKE 1381
MADISON, WISC.	Westinghouse Electric Supply Co. BADGER 4990
MEMPHIS, TENN.	Westinghouse Electric Supply Co. 8-4196
MIAMI, FLA.	Westinghouse Electric Supply Co. 3-3143
MILWAUKEE, WISC.	Westinghouse Electric Supply Co. DALY 1800
MINNEAPOLIS, MINN.	Westinghouse Electric Supply Co. MIDWAY 6515
NEWARK, N. J.	Westinghouse Electric Supply Co. MITCHELL 2-3450
NEW HAVEN, CONN.	Westinghouse Electric Supply Co. 5-5154
NEW YORK, N. Y.	Westinghouse Electric Supply Co. WALKER 5-6000
NORFOLK, VA.	Westinghouse Electric Supply Co. 2-2366
OAKLAND, CAL.	Westinghouse Electric Supply Co. GLENCORT 3177
OKLAHOMA CITY, OKLA.	Westinghouse Electric Supply Co. 2-7101
OMAHA, NEBR.	Westinghouse Electric Supply Co. JACKSON 4874

PEORIA, ILL.	Westinghouse Electric Supply Co. 4-1
PHILADELPHIA, PA.	Westinghouse Electric Supply Co. WALNUT 10
PHOENIX, ARIZ.	Westinghouse Electric Supply Co. 4-2
PITTSBURGH, PA.	Westinghouse Electric Supply Co. ATLANTIC 10
PORTLAND, OREGON	Westinghouse Electric Supply Co. BROADWAY 10
PROVIDENCE, R. I.	Wetmore Savage Div. GANPEE 60
RALEIGH, N. C.	Westinghouse Electric Supply Co. 4
READING, PA.	Westinghouse Electric Supply Co. 72
RICHMOND, VA.	Westinghouse Electric Supply Co. 2-90
ROANOKE, VA.	Westinghouse Electric Supply Co. 7
ROCHESTER, N. Y.	Westinghouse Electric Supply Co. MONROE 10
ST. LOUIS, MO.	Westinghouse Electric Supply Co. CENTRAL 40
ST. PAUL, MINN.	Westinghouse Electric Supply Co. GARFIELD 70
SACRAMENTO, CAL.	Westinghouse Electric Supply Co. MAIN 10
SALT LAKE CITY, UTAH	Westinghouse Electric Supply Co. WASATCH 10
SAN ANTONIO, TEXAS	Westinghouse Electric Supply Co. CATHEDRAL 62
SAN FRANCISCO, CAL.	Westinghouse Electric Supply Co. GARFIELD 42
SEATTLE, WASH.	Westinghouse Electric Supply Co. ELIOT 70
SIOUX CITY, IOWA	Westinghouse Electric Supply Co. 5-70
SPOKANE, WASH.	Westinghouse Electric Supply Co. MAIN 10
SPRINGFIELD, MASS.	Westinghouse Electric Supply Co. 4-3
SYRACUSE, N. Y.	Westinghouse Electric Supply Co. 2-6
TAMPA, FLA.	Westinghouse Electric Supply Co. M-50
TERRE HAUTE, IND.	Westinghouse Electric Supply Co. CRAWFORD 10
TOLEDO, OHIO	Westinghouse Electric Supply Co. MAIN 10
TRENTON, N. J.	Westinghouse Electric Supply Co. 62
TULSA, OKLA.	Westinghouse Electric Supply Co. 3-70
UTICA, N. Y.	Westinghouse Electric Supply Co. 4-10
WASHINGTON, D. C.	Westinghouse Electric Supply Co. NATIONAL 90
WATERLOO, IA.	Westinghouse Electric Supply Co. 10
WICHITA, KAN.	Westinghouse Electric Supply Co. 3-40
WILLIAMSPORT, PA.	Westinghouse Electric Supply Co. WILLIAMSPORT 2-40
WILMINGTON, DEL.	Westinghouse Electric Supply Co. 10
WORCESTER, MASS.	Wetmore Savage Div. 3-70
YORK, PA.	Westinghouse Electric Supply Co. 10

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AL 4
LD 7
IN 2
TCH 2
AL 6
LD 6
OT 7
...5-7
AIN 3
...4-5
...2-4
...M-5
ORD 1
AIN 8
...6
...3-7
...4-11
NAL 9
...1
...3-4
RT 2-4
...6
...3-7
...

se
NY



Better Lighting

FLUORESCENT FOR SERVICE STATIONS

This station of the Tidewater Associated Oil Company in San Francisco, uses 18- 20-watt T-12 daylight fluorescent lamps under the canopy, four in the station room, ten in the lubrication rack room, and two in each of the rest rooms.

On top of the canopy, in outline, are 30 milliamperes 15 millimeter daylight



FLUORESCENT PLUS NEON—Tube lighting has been used throughout to get this effect with a combination of red and green.

fluorescent tubes. The tower is lighted with a combination of red neon and green fluorescent tubing. The lower ring is red neon 30 milliamperes, 12 millimeter, the second ring fluorescent tubing and the third fluorescent "novial" green. The "Flying A" is fluorescent green tubing 30 milliamperes, 15 millimeter on the wings. The "A" is red neon 30 milliamperes, 12 millimeter.

MODERN STORE LIGHTING COMBINATION

The Al Baskin store, Joliet, Illinois, is an excellent example of tailored lighting. This newly remodeled store employs both filament and fluorescent

lamps, and makes use of cove lighting, totally indirect lighting from pendant units, and downlighting to achieve a distinctive sales room.

The picture shows the front section illuminated to 48 f.c., a combination of indirect and direct lighting. The indirect is provided by a ceiling cove equipped with 28 warm white fluorescent 36-inch lamps; the direct by downlights with 200-watt lamps.

To the right where customers make hat selections, downlights with 200-watt lamps give 60 f.c. To the left, the shirt department is lighted indirectly by three louver dome units set in 5-foot ceiling coffers, with 500 watt lamps, and 30 f.c. is obtained.

This same type of lighting in the center of the store has six 30-inch ceiling coffers with 300-watt lamps, combined with 16 fluorescent lamps—36-inch warm whites—located in ceiling coves on three sides of the room.

The suit department, in the rear, has 45 footcandles of fluorescent and incandescent lighting. Twenty 36-inch and twenty-five 18-in warm white, are located in the recesses of a 12-foot plateau ceiling. The filament lamps are in ten recessed 200-watt downlights and two 500-watt indirect units.



TAILORED LIGHTING—A combination of fluorescent and filament lamps in cove, pendant and downlighting gives this store distinction.



LIGHTING THE TELLER'S CAGE

—The fluorescent lamp produces "cool footcandles." Actual experiments with blindfolded people have established this fact. When light was directed on to their foreheads a barely noticeable increase in the sensation of warmth was detected at 600 footcandles for light from daylight fluorescent lamps and 125 footcandles for light from standard tungsten filament lamps.

This cool light is ideal for lighting tellers cages. This picture shows two of the cages in the Monongahela Trust Co., Homestead, Pa. lighted by two 15-watt daylight lamps, beneath the ledge.

COMBINATION LIGHT IN AUDITORIUM

A highly effective combination of fluorescent tube cove lighting and high intensity direct incandescent units in the ceiling is provided in the demonstration space and auditorium at the new Peoples Power Company building in Rock Island, Illinois. The installation, made by Leithner & Weishar, Electrical Contractors of Rock Island, consists of a continuous row of daylight fluorescent tubes concealed in a cove completely surrounding the room.



GIVES LASTING PROTECTION

G-E White Rigid Conduit gives permanent protection for electrical wiring systems. It is made of "rimmed" steel, hot-dipped-galvanized and Glyptal-coated inside and out. It is easy to bend and install. It has clean accurate threads. There is a complete line of boxes and fittings available.

OTHER G-E CONDUIT PRODUCTS

For wiring where rigid conduit is not specified or required, General Electric offers the following materials:

Flexible Metal Conduit
Electrical Metallic Tubing
"Fiberduct" Underfloor Raceways
Service Entrance Cable
"BX" Armored Cable
"Braid-X" Non-metallic Sheathed Cable

Exactly the right boxes and fittings are available for use with all types of G-E raceways and cables as well as with G-E White Rigid Conduit.

ADDITIONAL INFORMATION

For further information about G-E White Conduit or other G-E Conduit Products, see the nearest G-E Merchandise Distributor or write to Section C7410, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

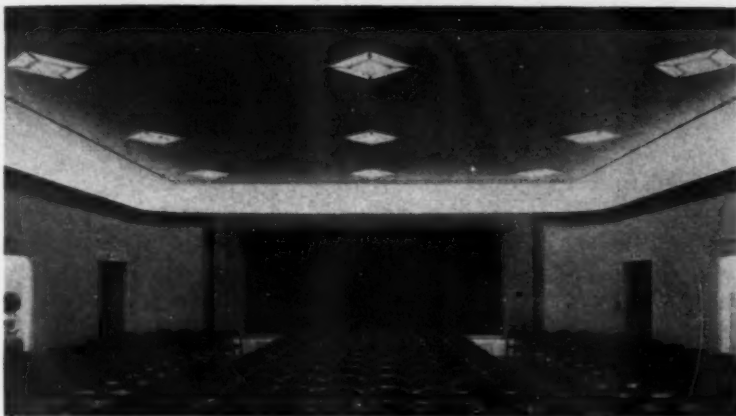
GENERAL ELECTRIC



[FROM PAGE 43]

General lighting of ten footcandles throughout the auditorium may be provided from this source alone.

For higher intensities, there are 12 special units set flush in the ceiling, consisting of a central reflector equipped with a 500-watt lamp and prismatic lens glass. The central reflector is surrounded by eight amber colored lamps covered with flashed opal glass giving a decorative band of gold around the fixture.



FLUORESCENT PLUS H.I.—Demonstration hall in the new Rock Island Peoples Power Company building uses high intensity diffused general illumination from ceiling fixtures plus concealed cove lighting from daylight fluorescent lamps.

LIGHTING FOR THE BAKERY

Bakery goods are bought to satisfy the sense of taste, so the baker creates pastries that look so good they make our mouths water. But the first appeal is to the sense of sight.

The store illustrated, the New York Bakery in Rochester, is utilizing light-

ing to its full extent as a sales agent. Six 500-watt indirect units, supplemented by six 200-watt recessed downlights, provided 35 footcandles of general lighting with 75 footcandles over the counter tops. The shadow boxes and the register niche are illuminated by a line of 60-watt white Lumiline lamps and the case panel lights by 25-watt lamps on 7-inch centers.



MOUTH WATERER—This lighting sells pastry through eye appeal in a Rochester bakery, with five kinds of lighting, but it also stimulates the sense of taste.

PRIVATE INTERIOR TELEPHONE SYSTEMS



*Easy to Sell
Easy to Install*



SERV-U-FONES

Low priced, all metal telephones, in common talking systems of two to ten stations. Conveniently packaged, simple to install.

IDEALFONES

Compact, wall type telephones, with molded plastic handsets. Available with one or five buttons for common talking service up to ten stations.

INTERCOMS

Use same handset as Idealphones, but available in both desk and wall styles. Common talking systems of two to eleven stations.

P-A-X's

Private automatic exchange systems providing dial service and secret connections. Available in any capacity from ten stations up, with telephones in a wide variety of types.

Easy to Sell: Automatic Electric Private Interior Telephone Systems are easy to sell because the market is particularly receptive. People are communication conscious—keenly aware of the time-, step- and money-saving advantages of intercommunicating service in offices, shops, factories and homes. And they are ready to buy!

This business belongs to you—cash in on it. It is within your field, the market is still practically untouched, and the profits are attractive. If you need help, the Automatic Electric field man is at your service.

Easy to Install. Automatic Electric Private Interior Telephone Systems are easy to install because each piece is labeled for instant identification, all equipment is designed for quick assembly, and complete instructions are expressed in brief, simple, non-technical language.

Shown here are four of the many types of Private Interior Telephone Systems available. Our local representative will gladly supply you with literature, prices and discounts, as well as work with you on specific jobs. A call will bring him promptly.

• [These Intercommunicating Systems are for private service. They cannot be connected with the public telephone system.] •

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Electrical Contracting, October 1939

65

Estimating

TROUGH LIGHTING

A recent installation of trough lighting in a millinery store gave the following interesting labor data:

Approximately 100 feet of 4" x 4" trough, in straight sections, was installed. The trough was lined with a snap-in reflecting surface with $\frac{3}{8}$ inch nipple extensions, on 12 inch centers, for angle sockets. The trough was built to order in 6 foot to 10 foot sections to fit the cases, and mounted on wood at a 7 foot height behind a dropped curtain wall.

Wiring sockets—includes assembling and wiring the sockets in the shop. Time per socket .18 m.h.

Trough wiring—includes mounting, assembling, and wiring the trough, mounting the sockets and all splices. Does not include wiring to the junction boxes, which were already installed. Time per foot .12 m.h. The above time study does not include non-productive or supervisory labor.

From Continental Electric Construction Company, Chicago, Illinois.

EFFICIENCY IN

CHECKING ESTIMATES

To eliminate fumbling through a sheaf of estimate sheets and to promote general efficiency in checking estimates, H. P. Foley Company, Philadelphia contractor, has set up a system that works. Here's how:—

The estimating forms are made of several different colors and grades of paper. The branch circuit schedule sheet is white and of a thin quality paper. The feeder schedule sheet is light green and of a slightly heavier bond. The conduit and wire summary sheet is a buff color. Two pricing and one recapitulation sheets are white and of a much heavier bond. These pricing sheets are slightly wider so they catch the thumb easily. These features enable the estimator to quickly find what he wants when he wants it.

ODD SCALES

When plans are drawn to any other scale than the customary one-eighth, mark each drawing affected in large characters in colored pencil through the title box. Take-off sheets affected should also be marked conspicuously with a colored pencil to set them off from other sheets.

REWIRING CLOCK SYSTEM

The rewiring of an automatic electric clock and signal system in 44 rooms of a Boy's Vocational School provided an opportunity to make a careful study of the labor used in doing the work. The building was 15 years old and there were no wiring plans showing the circuiting. All work was concealed in the walls.

The original systems included clock and bell circuits and an inter-room telephone system. Only 50 per cent of the clock system was in operating condition due to broken conduits and wires and low voltage at the clock stations.

Under the new plans, the telephone system was abandoned and all clock and bell circuits were rewired. The rewired clocks operated in series on 4 circuits with a maximum of 14—12 in. clocks per circuit. One 18 in. clock was

considered the equivalent of three 12 in. clocks. The bells operated on a multiple circuit with one common wire and an individual return from each bell to a pushbutton station on the 50-station manual board in the office.

The job actually consisted of:

A. Preliminary work:

(1) Tracing and checking original circuits.

(2) Removing blackboards and other materials to gain access to splice and pull boxes.

(3) Making a detailed circuit drawing of the new system and incorporating it with a drawing of the present conduit system.

B. Taking down and remounting:

(1) 26 buzzers—24 volts d.c.

(2) 18—6 in. bells—24 volts d.c.

(3) 44—12 inch clocks in classrooms.

(4) 3—18 inch clocks in gymnasium and auditoriums.

(5) 1 master clock—relocated in office.

(6) Removing all old wire.

C. Installing new equipment:

(1) 1 rectifier and transformer to replace original batteries for operation of bells.

(2) 1—50 station manual bell push board to work in conjunction with automatic tapes on program clock.

(3) 50 ft. No. 1000 wiremold recessed in walls to tie in the unused telephone conduits with the program clock. These telephone conduits had to be used because some of the original signal system conduits were broken or filled with fused circuit wires.

(4) Pulling in new wire in all circuits and making all connections.

All present conduits and outlet boxes were used. The only new raceway installed was that between the telephone box and the program clock.

The recorded labor breakdown for the entire job is as follows:

1. Preliminary tracing of circuits and making new circuit diagrams, 72 man hours
2. Removing 47 clocks and 47 bells and buzzers. Some of the bells and buzzers were incorporated in the clocks, 18 man hours

3. Removing old wire from conduits, 70 man hours

Of this 70 man hours, 40 were wasted in trying to pull out wires in the two key conduits leading from the master and program clocks. This was finally abandoned and the telephone conduits were used with a wiremold tie-in to the program clock.

4. Making 50 ft. chase, 1½ in. deep and 2½ in. wide, in plaster wall of office to recess wiremold 8 man hours
Average per foot..... .16 man hours

5. Installing 50 feet of No. 1000 wiremold with two box connections and one 90 degree inside ell..... 4 man hours
Average per foot..... .08 man hours

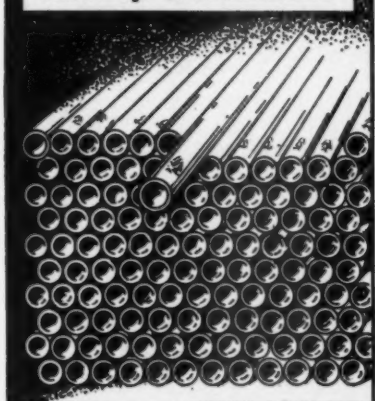
6. Pulling in 20,000 feet of No. 16 and 10,000 feet of No. 10 solid rubber covered Code grade wire. Average branch circuit was 80 ft. long with 3 bends in it, 96 man hours

One home run was 160 ft. long and the other 290 ft. long without a pull box in either one.
Average per 1000 feet.. 3.2 man hours

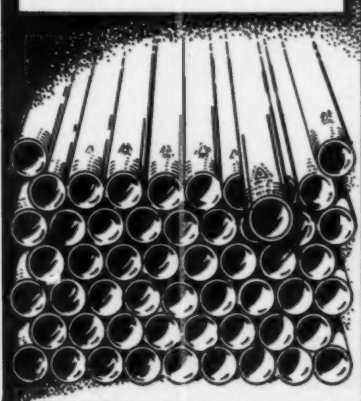


A. H. KESSLER, promotion director of North Central Associated Electrical Industries and Wm. A. Ritt, secretary-manager of the Minn. Elec. Council, rest together for a moment at the recent state meeting in Alexandria.

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Hot Dip Galvanized!**



RIGID CONDUIT ***Hot Dip Galvanized!***



HOT DIP ARMORED CABLE (Double Bushed)



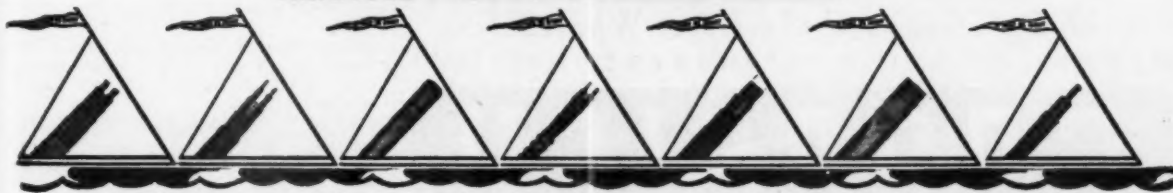
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FLOODLIGHTS FOR EVERY PURPOSE

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Goodrich Floodlighting Equipment is described in bulletin No. 71, "Here's How to Light the Night." Ask us to send your copy.

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Estimating

[FROM PAGE 44]

7. Remounting all clocks. 24 man hours
8. Making all connections 89 man hours

Total productive labor on entire job 369 man hours

9. Supervision—Electrical Contractor 30 man hours
- Supervision — Clock Manufacturer 24 man hours

Total labor on job.... 423 man hours

Data from E. J. White Co., Newark, N. J.

FUNCTIONAL INDEX

In transferring material lists from the take-off sheet to the pricing sheet, careful checking of each item can insure against error in detail. However, to prevent omitting entire take-off sheets or complete operations, the arrangement and tabulation of the pricing sheets should follow a standard pattern that can be adapted to all types of jobs.

Any kind of schedule that is reasonably logical may be adopted, providing that once such a schedule is adopted the estimator sticks to it. And, if there are several estimators in the shop, they should all adopt the same method. But many estimators consider the "functional" index as the most logical and safest method of arranging pricing sheets.

This method lists each major job operation separately and assigns one pricing sheet to each of the major operations. The rotation of the pricing sheets then follows, as nearly as possible, the same schedule as the operations would follow on the job, or the approximate schedule of material purchases.

This titling of pricing sheets and their rotation on a typical small school job, would be:

Sheet No. 1—*Service entrance.* This would include all of the work up to, and including, the service entrance switch and any overhead or underground work.

Sheet No. 2—*Panel boards and cabinets.* As this is one of the first items in the take-off and also one of the first items purchased when the job is started, a separate pricing sheet should be devoted to it. The labor unit would be extended on each panel, with probably only a single entry in the material price column.

Sheet No. 3—*Feeder conduits.* This would include all of the feeder conduit work including hangers and any special pull boxes required.

Sheet No. 4—*Branch circuit roughing.* Include all branch circuits, conduits, outlet boxes, involved in the roughing in operations on power and light circuits.

Sheet No. 5—*Signal circuit roughing.* Include all conduits, pull boxes, and outlets for all of the low voltage and signal equipment.



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NON-METALLIC
SHEATHED CABLE



The farm wiring material of first choice—and equally to be preferred for small homes, stores, and frame construction generally. No special fittings are required. Sold by Electrical Wholesalers Everywhere.

^{*}Trade-Mark

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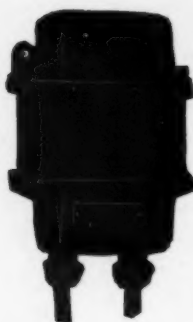
Electrical Contracting, October 1939

MERIT



Above: Type CFT, three-phase, outdoor-type, air-cooled, general-purpose transformer.

Below: Type CF, Single-phase, outdoor-type, air-cooled, general-purpose transformer.



Whenever it is desired to obtain a low-voltage supply from a higher voltage circuit you will find AmerTran Type "CF" Air-Cooled Transformers both economical and convenient to use. These moderately priced units may be installed wherever they are needed—either outdoors or indoors*—without the necessity of oil, fire-proof vaults or enclosures. All sizes are equipped with either conduit fittings or a built-in junction box to facilitate installation, and both single-phase and polyphase types are furnished as a single unit. Available in capacities up to 100 Kva. and for potentials up to 2400 volts, all ratings offer low initial investment, minimum installation and maintenance expense, and low operating cost. Let us send data on equipment to meet your needs. Ask for bulletin 1116A.

* Units rated 15 Kva. and larger for indoor service only.

Type "CF" Applications

1. Stepping down power circuit voltage to 115/230 volts for lights, small motors or heating elements. In this way advantage may be taken of lower power rates for low-voltage loads.
2. Obtaining a 3-wire circuit from a 2-wire system.
3. Changing from 3 phase to 2 phase, or vice versa, on a power system.
4. Obtaining low voltage for heating, welding, 32-volt tools, special lighting, testing, etc.
5. Balancing load on 3-phase systems.
6. Insulating one circuit from another.
7. Distributing power at 600 volts or less.
8. Reducing light flicker.
9. Obtaining special voltages to permit efficient operation of equipment.

AMERICAN TRANSFORMER COMPANY

178 Emmet St.

Newark, N. J.

AMERTRAN

Manufactured
Since 1901
at Newark, N. J.

TRANSFORMERS

Estimating

[FROM PAGE 48]

Sheet No. 6—Feeder wire. Include all wires for feeder circuits, with connectors and any operations having to do with the pulling-in or connection of the feeders.

Sheet No. 7—Branch circuit finishing. Include circuit wiring and wiring devices.

Sheet No. 8—Signal wiring. Include all conductors and cables and connecting equipment concerned in the signal circuits.

Sheet No. 9—Signal equipment. Includes clocks, gongs, fire alarms, special apparatus.

Sheet No. 10—Motors and control. Includes motors, bases, controls, mounting frames, and operations having to do with installation after the wiring is complete.

Sheet No. 11—Fixtures.

This type of functional outline can be elaborated or reduced to fit practically any type of job that the estimator may encounter. The principal advantage is that even one relatively unfamiliar with the job can skim over the pricing sheet titles, on the re-cap sheet, and determine whether a complete job is listed.

MACHINE THREADING

Light-weight, portable power machines for conduit cutting and threading have extended the electrical contractors' use of pipe threading machines to all sizes of conduit. The pipe threading machine now works up on the deck, and pipe threading costs in the branch circuit sizes are reduced. The inconvenience of dispatching nipples from the pipe machine to the mechanics on the forms, which often made it impractical to use machine cutting and threading on conduit under 1½ inch, is now eliminated.

The accompanying tables show the results of a time study comparison between hand cutting and threading and power cutting and threading on a vise stand type of portable pipe machine. (Oster No. 422). The machine has a ½ hp. motor and spindle for use with ordinary hand stocks and dies. These figures apply to the actual operations and do not include such factors as measuring and handling.

Power Vise Stand Speeds as Compared to Hand Threading							
Hand Method (Time in minutes and seconds)	1½"	2"	3"	4"	6"	8"	10"
Cutting-off.....	33	39	1-00	1-06	1-12	1-36	
Reaming.....	12	24	27	30	39	45	
Threading.....	1-30	1-43	3-00	3-39	4-00	5-00	
Total.....	2-15	2-51	4-27	5-15	5-51	7-21	
Power Vise Stand (Time in minutes and seconds)							
Pipe Size	1½"	2"	3"	4"	6"	8"	10"
Cutting-off.....	12	13	18	21	24	27	
Reaming.....	7	10	11	12	13	14	
Threading.....	55	1-00	1-07	1-09	1-11	1-13	
Total.....	1-14	1-23	1-36	1-42	1-48	1-54	
Saving Created by Use of Power Vise Stand							
Pipe Size	1½"	2"	3"	4"	6"	8"	10"
Time Saved.....	1-1	1-26	2-51	3-30	4-3	5-27	

Electrical Contracting, October 1939



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● Customer satisfaction is all-important on wiring jobs. It is assured when you use RACO • ALL-STEEL • PRODUCTS. They have won the nation-wide approval of architects, contractors, electricians and builders. This acceptance can be traced to the efficiency of these products in meeting modern wiring requirements economically.

Developed by competent engineers, RACO • ALL-STEEL • PRODUCTS keep pace with the changes in wiring trends—and present many advantages in the steadily increasing rural and urban modernization market as well as

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More than 40 years of experience is behind the switch boxes, outlet boxes, cutout boxes, cabinets, fuse cabs and conduit fittings carrying the famous RACO and ALL-STEEL trade-marks, assuring continued satisfaction and dependability. Write for a copy of the RACO • ALL-STEEL • PRODUCTS catalog—there is no obligation.

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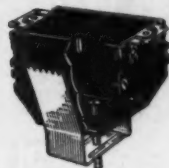
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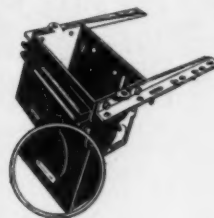
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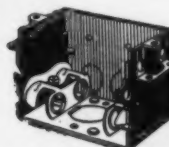
RACO ALL-STEEL

OLD WORK SWITCH BOX for mounting in a rewiring or modernization job.



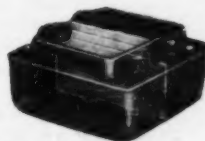
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RACO ALL-STEEL

SWITCH BOXES. The MC, used in old or new work. The Switch Box you need is in the Raco All-Steel Line.



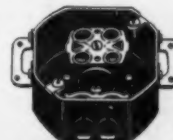
RACO ALL-STEEL

"HI-LO" BARRIERS for the separation of differing voltages.



RACO ALL-STEEL

UTILITY or HANDY BOXES for surface wiring—old or new work.



RACO ALL-STEEL

EXTERNAL MOUNTING EARS for Outlet Boxes. Any type of Raco All-Steel Outlet Box will be furnished with External Mounting Ears on special order.

Announcing WIREMOLD FLUORESCENT SHOW CASE LIGHTING



- So **FLEXIBLE** it can be fitted to most types of show case, display counter, wall case, mirror case, niche or cove . . . offers the contractor unlimited sales opportunity for all installations from the largest to the smallest.
- So **COMPACT** (see cross section) that it can be fitted to modern thin frame cases . . . requires minimum space, creates no glare in front or back of case.
- So **EASY TO INSTALL** with specially designed clips that fit all types of cases. **SNAPS** in place in the case. **SNAPS** out for cleaning case or relamping . . . a powerful exclusive sales feature.
- **Assembled "on the job"** from unit parts designed to fit standard cases or equally adaptable to special installations. May be interconnected with standard Wiremold Wiring Systems.
- Line includes *new, special, low cost*, complete 3 ft. **UNIT** ready for installation. Opens wide the tremendous small store market. Same unit gives you a perfect demonstrator that you can quickly place in the customer's show case and plug in to the nearest outlet (most prospects will never let you take it out again).

**SEND FOR YOUR
DEMONSTRATOR TODAY**

• Literally MILES of show cases are waiting to be equipped with modern Fluorescent Lighting. Be among the first in your territory to show how quickly and easily every store, large or small, can have this newest sales builder with Wiremold Fluorescent Show Case Lighting.



WIREMOLD
Your **BUSINESS BUILDER**

THE WIREMOLD COMPANY

HARTFORD, CONN.



Contractors In Philadelphia

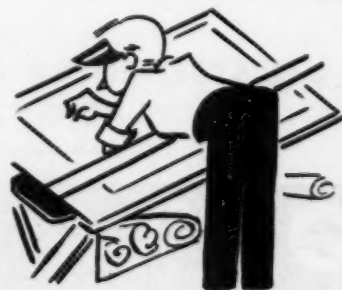
[FROM PAGE 18]

Association or to the power company from local manufacturers and business men who want electrical work done. The Association rotates these leads to the members of the division. Each lead goes to three contractors with letters to them, to the customer and to the utility man, if the lead came from a power man.

2. **Advertising**—A recent mail advertising campaign to 4000 industrial and commercial prospects, paid for by the Association, "certified" the members of this group and stimulated plant modernization.
3. **Industrial Shows**—For eight years Industrial Trade Shows have presented progress in electrical equipment and practice to architects, purchasing agents, consulting engineers, builders and building owners. There "Electrical Progress Exhibits" have featured these "certified" contractors.
4. **Cooperation**—Closer relations with manufacturers, wholesalers and the local utility have been fostered to the marked benefit of all concerned. The Philadelphia Electric Company, for example, relies upon these contractors for all work done on its system that falls within a customer's premises, including setting poles and transformers.

Philadelphia contractors are fortunate also in that the local power company is one of the most progressive and co-operative public utilities in the United States. Average domestic consumption on the lines of the Philadelphia Electric Company has risen from 470 kwh. in 1928 to 962 kwh. in 1938 and will pass 1000 kwh. before the end of this year. This is an amazing progress for any large city. It has been achieved through intensive public education and market development, that has greatly increased the opportunity for the electrical contractor.

Glimpses of Ourselves



7

SUPER-RANGE BENDER HANDLES up to 4"

CONTRACTORS and Plant Electricians everywhere have asked for a Porto-Power Bender to handle up to 4 inch pipe. Blackhawk DOES MORE than meet this demand—Blackhawk adds time-saving refinements to the remarkable Porto-Power Pipe Bending principle and creates the NEW MODEL S-36! Here are some of the BIG FEATURES:

SUPER RANGE—Model S-36 bends rigid conduit and pipe in popular 1½", 1¾", 2", 2½", 3", 3½" and 4" diameters.

NO JACK KNIFING—No loose extension bars, tension arms and ram collars . . . the Bending Frame is ONE sturdy unit!

SPEEDY SET-UP—“Pull Pin” with Lock-on fitting quickly fastens four-sided Pivot Shoe in any one of six positions on Bending Frame. No bolts and nuts—no monkey wrenches.

LIGHT WEIGHT—Bending Frame and ram with 4" bending set-up weighs only 128½ lbs. Entire S-36 weighs only 190 lbs.

ROLL TO THE JOB—Pivot shoes on ends of Bending Frame have large rims—serve as wheels for rolling bender along floor.

POWERFUL HYDRAULIC UNIT—20-ton ram plunger coupled with high-pressure all-directional hose and hand-operated pump. (Ram also used with special attachments for pulling pulleys, gears, etc., and for wide range of press, push, and lift jobs in construction and maintenance).

RETRACTO-RAM—Finger-turn of pump release valve causes ram plunger to retract automatically — to proper distance for successive positioning of pipe after each bend.

LOW-COST—Porto-Power is standard equipment in dozens of other fields—permitting low-cost production of the perfected and remotely controlled hydraulic unit.

ORDER FROM your Industrial Supply house TODAY — or send coupon to Blackhawk for catalog and prices. Pay for Porto-Power on the next job through big savings in time and materials!

A Product of **BLACKHAWK MFG. CO.**
MILWAUKEE, WIS.
DEPT. P2009

NEW S-36 shown bending 4" pipe. Operator controls quick 20-ton ram action from hand-operated pump.

New
S-30-A

SOLD THROUGH ESTABLISHED INDUSTRIAL SUPPLY HOUSES

BLACKHAWK

BLACKHAWK MFG. CO., Dept. P2009, Milwaukee, Wis.

RUSH new Pipe Bender Catalog and prices—also name of nearby distributors.

Name.....

Company.....

Address.....



We were working on the rewiring estimate for the change-over in production at the D & S plant. It had to be in the manager's hands by 4 P. M. Monday, which meant that Bill and I were stuck for the weekend.

Sunday afternoon we got to the point where we needed to compare different makes of metal moldings, and select the one that would enable us to run through ten No. 12 single conductors. We hunted high and low—no manufacturers' catalogs in the files could help us.

"We're sunk", said Bill, "No time now to even wire for the dope."

Then I remembered the blue-and-orange Electrical Buyers Reference. It was the work of a few moments to compare the catalog data of several leading molding manufacturers, and find all the information we needed. By noon Monday our bid was in, complete in every detail.

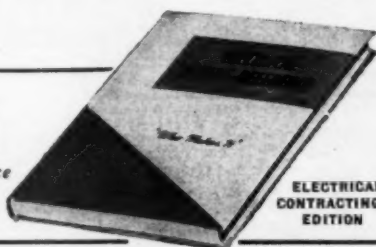
**"WE'RE SUNK—
that estimate has
to be in Monday!"**

★ **YOU'LL SAVE TIME AND MONEY** by looking in *Electrical Buyers Reference*—first. In one handy volume you have data on thousands of products made by hundreds of manufacturers . . . instantly, accurately.

— *Electrical* — **BUYERS REFERENCE**

A Unit of the McGraw-Hill Reference Service

330 WEST 42 ST. NEW YORK, N. Y.



More Gossip

Bare Neutral OK

Code permission for the use of bare neutral conductors and thin wall insulation would open up rewiring and relighting jobs all over town, says Walter Diecks of the Walter Diecks Electric Co. of Louisville, Ky.

Mr. Diecks, who is president of the Louisville Contractors Association and active in Kentucky Chapter, I.A.E.I. affairs would, however, like to see several of the methods of wiring now approved eliminated from the code in the interests of industry standardization.



YACHTSMAN H. G. Hoffman of *Tennessee Armature & Electric Co.*, Knoxville, is a great booster for the natural beauties of Eastern Tennessee and the Great Smokies. His latest enthusiasm—boating. And for those unbelievers who wonder where the heck you could put a boat in that country, he points out the newly created lake with 800 miles of shore line, caused by the erection of Norris Dam.

Bamboo Insulators

In these days when we are striving so hard to keep electricity safe for the protection of the public, it is interesting to remember that the old Planters Hotel in St. Louis was wired with bamboo insulators. This was one of the earliest wiring jobs. Sections of bamboo fishing poles were sawed apart, drilled at the end and used as tubes. They held the wire safely for a long time.

Builds New Home

The Bar-Croft Electric Co., of New Haven Conn. is planning to build a new home at 571 State St., New Haven. Plans and specifications are now ready. They expect to be in the new building about the first of December, with a modern office and shop for their contracting and motor repair business.



THE KWIKCHANGE line is complete with single pole, three-way, four-way switches; power receptacle, radio receptacle with plug caps to fit and separators; pilot and night light receptacles; push button with name plates and blank receptacles; connecting links—jumpers for easier wiring; three and four inch round covers for one or two devices; handy box covers for one, two and three devices—complete in every detail for any and every kind of combination.

Try the KWIKCHANGE line on your next wiring job—you'll serve your interests best.

**SEND FOR OUR
COMPLETE CATALOG
OF WIRING DEVICES
for your every need.**

The **KWIKCHANGE**

LINE OF WIRING DEVICES

BY

LEVITON

A full line of

**MODERN and UP-TO-DATE
WIRING DEVICES**

QUALITY IN EVERY DEVICE

LEVITON MANUFACTURING CO.

236 GREENPOINT AVE., BROOKLYN, N. Y.

111 N. Canal St., Chicago, Ill. 420 S. San Pedro St., Los Angeles, Calif.

SELECT G-E BUILDING WIRE

Available in all the new
Standard Grades

Approved by Underwriters'
Laboratories



The size, type, voltage and insulation are printed on the braid of all these wires permitting quick identification. They are made of the finest raw materials obtainable. They are easy to strip. Diameters are uniformly small. Different colored braids make circuit testing easy. All of these wires regardless of grade of insulation have the same high-quality finish. Generous coatings of paraffin make wire pulling easy.

For further information see the nearest G-E Merchandise Distributor or write to Section W-9410, Appliance and Merchandise Dept., General Electric Company, Bridgeport, Conn.

GENERAL  ELECTRIC

More Wiring for the 3 "R's"

[FROM PAGE 15]

To handle the rewiring of several buildings at the same time, the contractors used various methods of organization—

The H. B. Frazer Company had one man in the office in charge of all engineering details and approvals. Another man worked between the office and all jobs, handling inspections and cooperating with the custodians of the schools. One general foreman went from school to school, checking and ordering materials, providing labor and supervising the job. Meanwhile, a foreman in each school headed a crew of four to five men. In the larger schools seven to nine man crews were used.

All work followed a master production schedule, based on equipment delivery dates. All the smaller schools, which required no special equipment, were completed first. Doing the small buildings first gave the men the experience needed to handle the larger jobs efficiently. It also gave time for the delivery of large equipment. As many as 12 jobs were in operation simultaneously.

The Electric Power Construction Company handled its 36 schools by groups of six schools each. All schools located in the same area were wired at the same time regardless of size. Feeder and switchboard work, which required shut downs, was done during the summer months. Other work was installed during the school term. Fourteen schools were wired at the same time and for a period of eight months a maximum crew of 47 men were required to complete the project.

Some contractors used one crew to install services only, moving from school to school. Other crews did panelboard and branch circuit wiring. Each contractor devised his own method of organization.

School Board Helped

Headaches in estimating were numerous. The period available to prepare the bids was comparatively short and since no two buildings were identical, individual surveys had to be made in each building. Contractors credit a good part of their success to cooperation given them by the school authorities.

For example, to speed the work done while classes were in session, classes were shifted to other rooms as the work progressed. The average time to com-

plete one building varied from two to three weeks, in the smaller schools, to several months in the high schools.

The Board of Education of Philadelphia made extensive preparations. In the special rooms for pupils with defective eyes research began in 1932. This included experimental painting of walls and blackboard trim as well as trial installations of different types of fixtures with various spacings and mounting heights. A combination mercury vapor-mazda installation was tried. Fluorescent units are now being studied.

Wide Research

Research on regular class rooms included trial installations of various types of units with special equipment for woodworking and machine shops, textile classrooms and auditoriums. The same type of fixture would be temporarily installed in one room of an old building and a room of a modern building. Spacings, intensities, mounting heights were studied in each case. Careful readings in each room were taken before making a decision.

Supplementary studies of various window shades were also made, to choose the shade which would transmit the maximum amount of daylight with the proper direction, diffusion and least glare. The ultimate aim of all this research was to determine the proper units, paint, spacing and mounting heights to use to obtain the greatest amount of glareless illumination on the working plane.

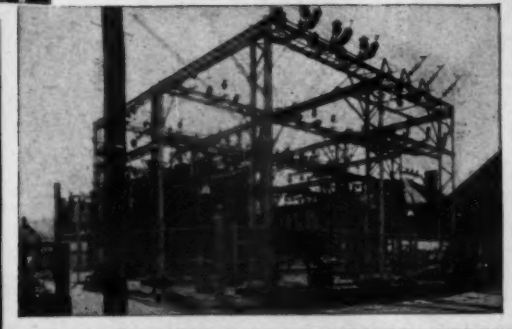
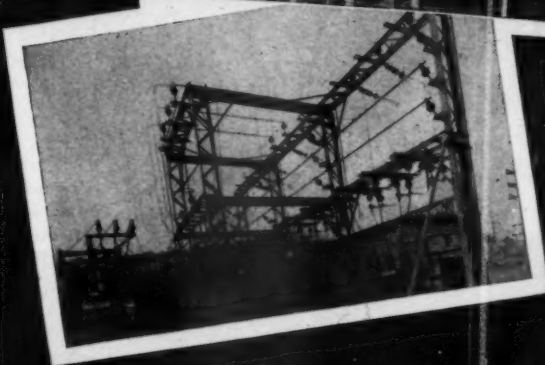
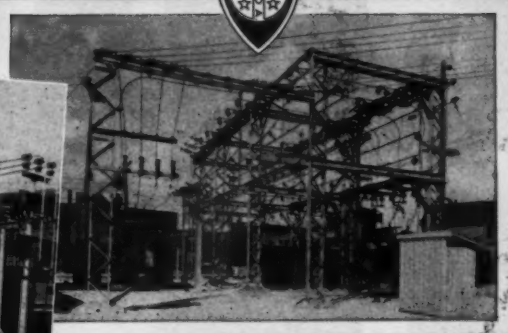
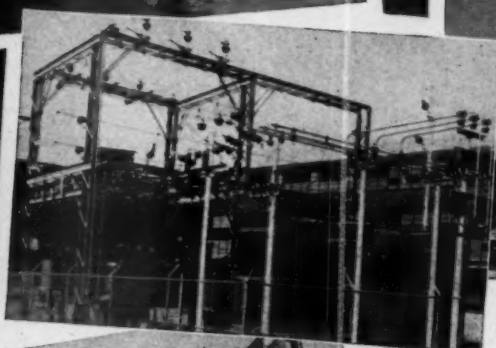
Plans and specifications were prepared in the offices of the Board of Education after final checks were made on the trial installations. Foot candle intensities were based on the "American Recommended Practice of School Lighting" prepared by the Illuminating Engineering Society and the American Institute of Architects. The same general plans and specifications were used for all the schools, with revisions to suit individual buildings.

The entire project requiring one year to complete will cost approximately \$1,423,319 and the Public Works Administration made a grant of approximately \$650,000. The smallest electrical contract for \$56,655 covered 26 elementary schools. The largest single contract was for \$259,730 and covered eight high schools and one elementary school.

The improved conditions will enable the students to work with less fatigue and strain. The new lighting in the "sight saving" classrooms has definitely proved its worth already.

THESE WEST PENN POWER COMPANY SUBSTATIONS ALL EMPLOY

Tubular Alcoa Aluminum Bus Bars



Tubular Aluminum Bus Bar, though light in weight, has the rigidity required where supports are widely spaced. Deflections are small, construction is neat in appearance, and stays that way.

Standard construction methods are used with

Alcoa Aluminum Bus Bar—tubular, flats, channels or angles. Inexpensive fittings are available. Our engineers will gladly assist you in selecting materials best suited to your needs. ALUMINUM COMPANY OF AMERICA, 2197 Gulf Building, Pittsburgh, Pennsylvania.





FROM MINIATURE TO

EVERYTHING IN TRANSMISSION: Bearings—Collars—Clutches—Couplings—Contactors—Hangers—Pillow Blocks—Pulleys—V-Belt Sheaves and Complete Drives.

Wood's V-BELT DRIVES

WOOD'S V-BELT DRIVES transmit developed power with minimum loss . . . run smoothly . . . evenly . . . absorb backlash and jerks which prolongs the life of the motor. Only sheave grooves that are precision machined, accurately spaced and absolutely true, with side walls at perfectly uniform angles can make possible such invariably long-lived, economical performance!

Our stock assortment consists of nearly 2800 drives, from $\frac{1}{4}$ h.p. to 100 h.p., with at least a dozen selections of center distances for each drive. SPECIAL RUSH DELIVERY SERVICE on emergency jobs—shipment of stock drives same day order received.

T. B. WOOD'S SONS COMPANY · Chambersburg, Pa.

Some good territory still open to alert distributors!

MAINTENANCE IS BIG BUSINESS

MAINTENANCE is one of the most important branches of business. It is vital to profits and to progress.

An enormous amount of money is spent by management each year in this electrical system housekeeping. Nobody has ever totaled up these dollars. But if you could, it would certainly make management sit up and take a new look.

Money spent for maintenance is like the cost of insurance. The modern business man is completely sold on it. But insurance buys protection against accidents that may happen. Maintenance is protection against wear, deterioration and other troubles that there is no doubt about. They do and will happen—day by day.

Every plant electrician, every maintenance man should keep this fact in mind. He should take every opportunity to impress it upon the mind of management. They as well as the maintenance staff should have a clear picture of what maintenance work involves.

That is the purpose of this series of articles which began in January, 1938, with a frank review of the electrical maintenance man's job. Then came—

1. Alternating Current Motors—Types and Applications
2. Direct Current Motors—Types and Applications
3. Alternating Current Motors—Maintenance
4. Direct Current Motors—Maintenance
5. A.C. Motor Starters and Controllers—Types, Applications
6. D.C. Motor Starters and Controllers—Types, Applications
7. Maintenance of Control Equipment
8. Special Control Problems—Heavy Installations and Maintenance
9. Electric Distribution
10. Lighting
11. Electric Heat
12. Electric Welding
13. Interplant Communication
14. Instruments
15. Power Tools
16. Batteries and Rectifiers
17. Electroplating
18. Electronic Devices
19. Circuit Breakers
20. Equipment for Hazardous Locations
21. Transformers (this issue)
Coming articles will discuss
22. Wiring Devices and Fittings
23. Wire and Cables
24. Drives
25. Elevators, Conveyors, Cranes and Trucks
26. Ventilating and Air Conditioning Equipment
27. Management of Maintenance

Electrical Maintenance

TRANSFORMERS

Types, Application and Maintenance

WIDE use and application of transformers in factories and large buildings brings increasing need for a thorough understanding of this class of equipment. The electrical maintenance man must not only know how transformers function but must be able to keep them in operating condition. Therefore this discussion presents information on the various types and applications of transformers, on factors to be considered in their selection, and on how they should be maintained.

A transformer as referred to, is an apparatus used on a.c. systems for changing voltage and current from one value to another. It is used also for transferring power from one circuit to another.

In industrial plants, commercial buildings and institutions, transformers are employed principally for transforming high voltage to the proper or safe value for innumerable uses, such as lighting and operating motors, portable tools, appliances, control, signaling and communication circuits, welders, furnaces and ovens. Other uses are for X-ray work, electrical testing, phase changing, circuit isolation, and electronic devices of all kinds.

Types and Applications

Transformers are made in a variety of forms to serve diverse purposes. They may be classified as follows:

1. *Power transformers* are used, as at generating stations, to step up voltage to values suitable for economical transmission of large amounts of power.

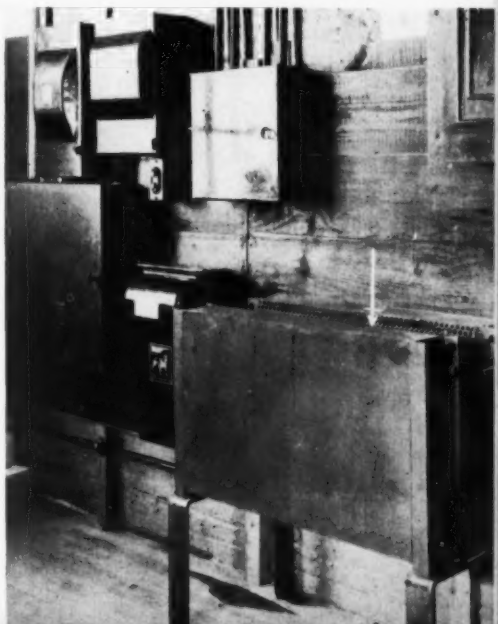
Also, they are used as at the end of transmission lines to step down the voltage to distribution voltages.

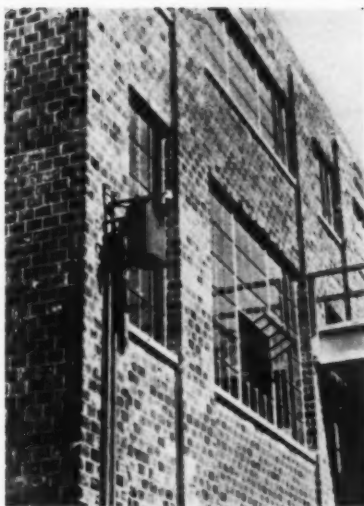
2. *Distribution transformers* are used to transform power from distribution voltages to a lower distribution or "utilization" voltage, such as from 2300 volts to 230 or 460 volts. These transformers may be insulated either by liquid or by air.

3. *Instrument transformers* are used to transform a high voltage or current to lower values, thereby permitting power to be measured by instruments

FOR GENERAL PURPOSE USE—

An air-cooled distribution transformer equipped with a built-in junction box. Dry type transformers may be located indoors. This unit rated 75 kva. 3-phase furnishes 115-volts for lighting from a 460-volt supply circuit. (American Transformer Co. photo.)





ON OUTSIDE WALL—This liquid-cooled 15 kva., single-phase, 2,400-120/240-volt transformer is conveniently mounted, yet out of the way. (Allis-Chalmers photo.)

of reasonable size and cost, and without danger to human life. These transformers are known as *potential transformers* or *current transformers*. They may be either air or liquid insulated.

4. *Control transformers* are used to supply small amounts of power, usually at relatively low voltage, to circuits which control electrical equipment and the operation of machinery.

5. *Bell ringing transformers* are of the small dry type, used to supply power at 24 volts and less to bells, buzzers, chimes, signal lights and the like. This low voltage permits the use of open-type wiring between the transformer and the device. In addition, these transformers have "high reactance," limiting the amount of current which the transformer will draw from the line, if the secondary circuit accidentally becomes shorted.

6. *Gaseous tube and ignition transformers* are used for operating gaseous tube signs and for ignition work. They step up voltage. The secondary winding is often grounded in order to reduce the physical size of the unit and to increase its efficiency and reliability. These units are usually air insulated, although special applications may make the use of liquid insulated units desirable.

7. *Furnace transformers* of the step-down type are used to supply high current at low voltages to resistance and salt bath furnaces. The step-up type is used to supply power to induction or "high frequency" furnaces. *High reactance transformers*, either step-up or step-down, are used to supply power to electric arc furnaces. All these units are made in both the

liquid insulated and air insulated types.

8. *Welding transformers* of the step-down type, in both liquid and air insulated varieties, are used to supply high current at very low voltages for the various kinds of resistance welding and for electric soldering. Transformers, usually of the air-insulated step-down type, are an essential part of most a.c. arc welding sets.

9. *X-ray transformers* step up voltages to values of several hundred thousand volts for use in X-ray equipment, but the current is relatively low. This type of transformer is usually liquid insulated and sometimes air insulated.

10. *Testing transformers* of the step-up type are used to supply a voltage higher than the normal operating voltage of an equipment in order to prove out the insulation of new electrical apparatus, devices and appliances. Stepdown transformers furnish a high current at relatively low voltage to determine the current-carrying capacity of equipment such as bus-bar, contact points, cable and circuit breakers. Testing transformers are made in both the liquid and air insulated types.

Closely related to transformers are—*Auto-transformers*—used where conditions do not necessitate isolating circuits.

Induction regulators—used to obtain constant or variable output voltages.

Reactors—used to limit amount of current in a given circuit, balance loads or furnish a drop in voltage.

Insulating and Cooling

As already noted, most transformers are furnished either liquid insulated or air insulated—

Liquid insulated transformers at one time were always filled with a special grade of insulating oil. But oil, being inflammable, precludes the use of oil-immersed transformers in many locations, especially indoors, unless the transformers are inclosed in fire-proof vaults.

So non-inflammable insulating liquids have been developed within the past few years. This largely overcomes the fire hazard and today most of the leading transformer manufacturers offer units filled with a non-inflammable liquid.

The liquid used for insulating a transformer is also the medium for cooling the core and coils. In order to be effective, therefore, the liquid must cover the core and windings, and must not be allowed to become contaminated.

Foreign material in the liquid may cause electrical failure, due to de-

creased dielectric strength, or may cause overheating, due to poor liquid circulation in and around the active parts of the transformer. Care must be taken to keep the liquid in good condition as recommended by the manufacturer.

Air insulated transformers may be of the very simple type which consists of the core, coils and mounting structure only, and which depend on the natural circulation of air for cooling purposes. Others may be designed for cooling by forced circulation of air.

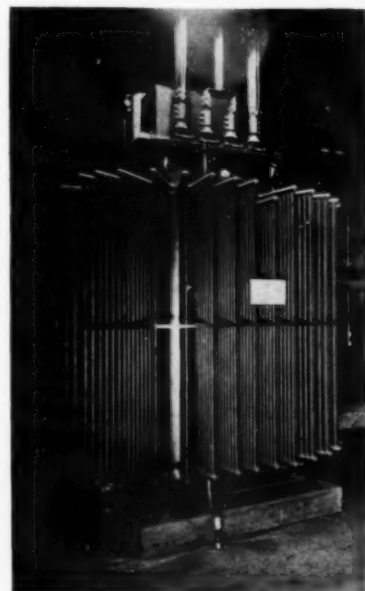
Still other transformers may be enclosed in a sheet metal or cast case and sealed with either a solid or jelly-like insulating compound. Such a compound often serves these further purposes—

1. Increases the dielectric strength of the unit;
2. Seals the windings against moisture, fumes and vapors;
3. Helps conduct the heat generated in the windings and core to the outside of the enclosing case, where it may be dissipated by radiation, convection, or forced draft.

Selection

In selecting transformers for any one particular job, the following factors should be considered—

1. *Secondary circuit* — load, voltage, number of phases and power factor.
2. *Kind of load*—intermittent or steady.

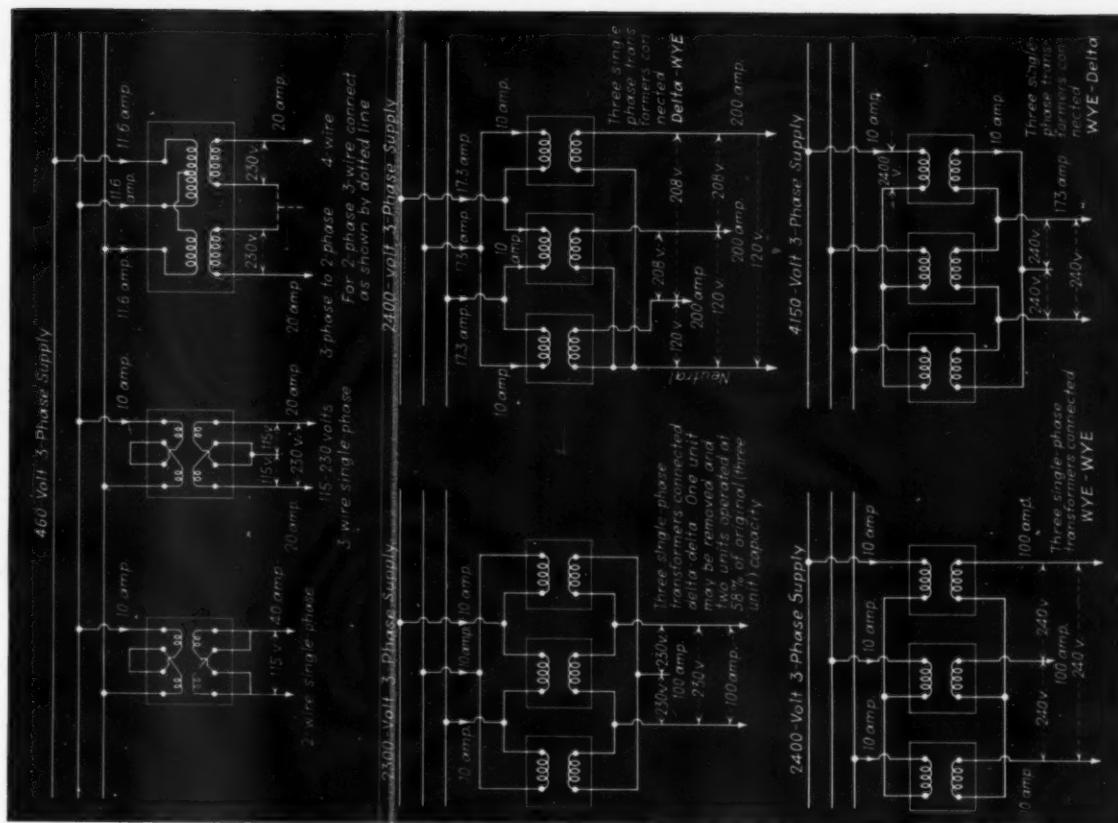


IN A HOT-STRIP MILL—One of three liquid-cooled (Pyranol) transformers located in the motor room, furnishes 230- and 460-volts from 11,950 and 6,900-volt supply. (General Electric Co. photo.)

MAINTENANCE GUIDE CHARTS FOR TRANSFORMERS

TROUBLE CORRECTION CHART

TYPICAL CONNECTIONS



TROUBLE	CAUSE	REMEDY
No secondary voltage	Primary fuses blown, circuit breaker tripped	Replace fuses or reclose breaker
Transformer overheating	Transformer shorted, open circuited, or insulator failed	Transformer must be replaced or repaired, or insulator replaced
	Overload on secondary	Check load and adjust to proper value
	Partial short circuit in primary or secondary	Repair or replace damaged coil
	Poor ventilation	Clear ventilating ducts, louvers, and windows of enclosing structure
Transformer overheating (liquid filled)	Over-voltage applied to primary	Adjust tap selecting device to proper terminal or remedy voltage supply
	Incorrect connections	Check connections for paralleling, or between phases. A common error is to connect the secondaries of a polyphase bank in parallel
	Cooling liquid carbonized or "sludged"	Clean core and coils, and purify or replace liquid
Intermittent loss of power	Loose terminal and connections	Tighten all bolted joints and check solder and solderless terminals

as in welding or lighting. This determines whether a transformer with high all-day efficiency would be suitable or one having particularly good regulation and high overload capacity.

3. *Power supply*—amount available, voltage, frequency and number of phases.

3. *Rating*—capacity in kva., frequency, voltage of primary and secondary, number of phases, temperature rise, and ratio of transformation.

5. *Method of cooling*—liquid or air. If liquid, whether oil or non-flammable. Method is determined often by location. If placed outdoors, oil-immersed units will probably be most suitable. If for indoor installation, the cost and overload ratings of the various types must be taken into consideration.

6. *Location*—near load center, accessible, ease of inspection, ventilation, cooling. If housed, adequate provision must be made for air circulation or cooling water, if water cooling is used.

The use of one single-phase, several single-phase or polyphase transformers will be determined by the load conditions, the space available, and the utility company's regulations.

Installation

When received and before installation, a transformer should be checked for rating, inspected for displacement of parts or injury. It should be examined thoroughly for indications of moisture, particularly if it is of the oil-immersed type.

As a general rule, transformers should be placed as near as possible to the load center. Each installation will be determined by the locations available for the actual placing of the units, and the cost of the wiring versus the cost of several load centers, as well as the limits for voltage drop regulation.

All installations should be made according to the National Electrical Code, and state, municipal, utility and insurance companies regulations and rules. These rules will govern most decisions as to connections, grounding, protection in the primary and secondary circuits, and provisions for safety.

Rating

Transformers are rated in va. (volt-amperes) or kva. (kilovolt-amperes). The ratings are derived from the product of the rated voltage and rated current of a particular winding.

Compensation for low or high supply voltages is accomplished usually by means of voltage taps. In distribution and general purpose transformers, the taps are placed usually in the high tension winding so that the tap-changing device will carry a minimum amount of current. The tap-changing device may be either a tap changer (switch) or a terminal board with links.



CURRENT TRANSFORMER, of the indoor dry type, ready for installation. This transformer, having a current rating of 100 amperes to 5 amperes for 5000-volt service, permits the measurement of large current values by small moderately priced instruments. (Westinghouse photo.)

In a two- or three-phase bank of single-phase transformers, the rating of the bank is the sum of the rating of the single-phase units.

A three-phase delta-delta connected bank may be operated open-delta in case of damage to one of the single-phase units, by disconnecting the damaged unit entirely. The bank will not supply two-thirds of the load, as might be expected, but only 58 per cent. Under such operating conditions care must be exercised to be sure that the load does not exceed the rating of the open-delta connected bank.

Maintenance

Because transformers have no moving parts, the maintenance man may think that servicing is not required. Such is not the case, however. The servicing of transformers, particularly liquid-immersed units, will be amply repaid by the increased life and reliability of the apparatus. Therefore, the maintenance man should make regular inspections as follows:

1. Liquid level should be checked at least once a year and enough liquid added to bring the level up to the transformer manufacturer's mark.

2. Insulating fluid should be checked periodically for dielectric strength and sludging (carbonization). It should be kept at a value of 22 kv. when tested in accordance with A.S.T.M. recommendations. Minimum should be regarded as 18 kv. If lower values are obtained, the liquid should be either purified or replaced.

3. Temperature should be checked daily.

4. Voltage and load condition should be checked periodically to determine that transformer is not being overloaded. This check should be made particularly when sludging is noted. Dark oil or oil with carbon particles in suspension indicate "sludging" and perhaps overheating.

5. Ventilation should be checked at regular intervals to make sure that ventilating ducts or windows are not clogged or thoughtlessly closed.

6. Cooling tubes or radiators should be kept free of dust or other foreign material. "A layer of dust is often equivalent to a layer of asbestos."

7. Connections should be checked at regular intervals for tightness, corrosion and unauthorized connections. A loose connection will soon cause excessive heating and loss of power or a short circuit.

8. Insulation resistance should be checked periodically to detect incipient failures. A megger test is recommended each time the liquid is filtered or replaced. In dry type transformers megger tests can be made during regular plant shut-downs or inspection periods. High potential tests in accordance with the manufacturer's recommendations are also very valuable indications of impending trouble, and they may save expensive enforced shut-downs.

9. Transformers that have been submerged or flooded should be thoroughly reconditioned. Coils, core and tank must be cleaned by removing sludge and other accumulations. Insulation must be dried gradually and tested. Liquid should be tested for moisture and if necessary filtered or dried.

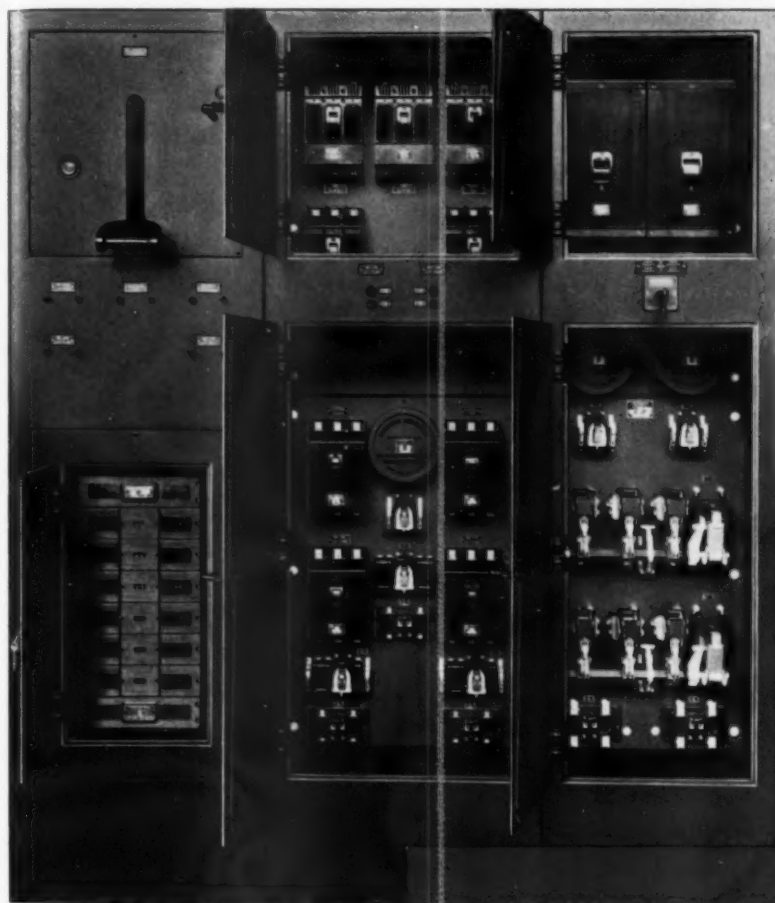
10. Secondaries of instrument transformers for measuring current should be short-circuited, and those for measuring voltage should be open-circuited, until the values are known to be safe.

Connection diagrams supplied by the manufacturer should be kept on file at all times, as well as authorized connections of all transformers, also a complete servicing record is recommended. For a study of such a record may often prove valuable in planning extensions or any other changes of a distribution system.

Spare parts, except spare fuse links, usually are not carried in stock. But if a large number of transformers of the same size and manufacturer are used then spare coils, or spare core-and-coil sets may well be stocked. Better still, however, is the stocking of a complete spare unit which need not be of the same manufacturer or kva. rating, unless it must parallel with existing units.

Since transformers have no moving parts, they present a hazard not present in many other types of electrical equipment. They may appear and sound perfectly harmless, but still be operating at full voltage and capacity. Therefore, extreme care must be exercised in working on or near them. The maintenance man must not take for granted that a unit is "dead." He must make absolutely sure that both the high and low voltage sides are disconnected before attempting to service transformers.

NEAT, EFFECTIVE CONTROL



Open view, Special 3 Section, Dead Front, Enclosed, Floor Mounted Switchboard. It houses Incoming Line, Lighting Distribution, and Motor Control for 2 Low Lift, 2 High Lift, and 1 Washwater Pump Motors. All motors are 220 volt, 3 phase, 60 cycle.

In a Mid-West Water Filtration Plant, this "3C" Panel provides maximum safety with extreme neatness. With doors closed, the entire front is "dead," and arrangements for locking are provided on each door, so that unauthorized persons may not tamper.

Shown above are the "3C" Overload Relays, Contactors, Pressure Regulators, Push Buttons, etc. that give unexcelled motor protection.

A folder describing many "3C" Sewage Disposal Plant and Water Works installations is yours on request.

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Just what a busy contractor needs—no lost time—no complicated installation troubles—more time for more jobs—RESULT: more earnings. The method of installing is really simple. Two squeezes on the handles of the B-M Indenter (shown) and the B-M Connector or Coupling is securely and safely fastened. You can save enough on the first job to pay for the Indenter. Our tools and methods are patented and we limit their use to the installation of our fittings only. Listed by Underwriters' Laboratories. See your Wholesaler—find out about this time-saving method.

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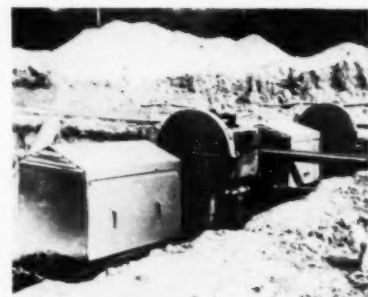
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Saved \$1 a Day Per Pump

When electrically operated pumps were used on a recent job done by the Vogt Paving Co., Massilon, Ohio, no attention was required other than occa-



No attention except occasional greasing was required for these electrically operated pumps.

sional greasing. Electric drive also produced quiet operation. This was an advantage when instructions were given to employees working in the vicinity of the pumps.

The company reported an overall saving of about one dollar for every 24 hours of operation of each motor-driven pump.

Maintenance Points For Synchronous Motors

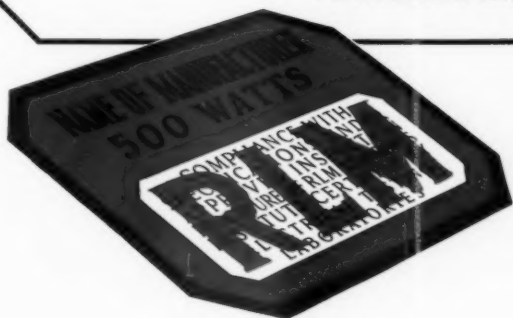
Synchronous motors, although they are rugged, require more attention than squirrel-cage and wound-rotor induction motors. The reason is that synchronous motors have more parts to be inspected, particularly when the motor and d.c. exciter are installed as a unit. In such cases, attention must be given not only to the motor but also to the exciter. And, the control equipment must not be overlooked, as it involves more devices.

The maintenance man is acquainted with the conditions at the individual installations. His experience and judgment will aid him in determining the frequency and degree of thoroughness for inspection. But whatever schedule is arranged, daily or weekly, the following twelve points are the main ones requiring attention.

1. Clean motor, exciter and control at regular periods, preferably with an industrial vacuum cleaner. Blown-out dust settles again; also particles may become imbedded.
2. Check oil level and add oil only when necessary and when motor is idle.
3. See that oil rings turn and that bearings show no signs of undue heating.
4. Inspect brushes on collector rings and commutator. Replace broken or worn brushes by new ones of the same grade or

Announcing HIGHER LIGHT REFLECTION and OUTPUT Specifications for the RLM DOME REFLECTOR

*The most universally used of all
Industrial Lighting Reflectors*



Again—More Light at NO EXTRA COST

As a result of careful engineering study, research and tests, the RLM Specifications for light output efficiency in the RLM Dome Reflector again have been increased. Thus the RLM Label on industrial lighting reflectors becomes of even greater value in assuring the purchaser of MORE LIGHT AT NO EXTRA COST.

The new RLM Specifications establish a new high mean reflection factor for the porcelain enamel reflecting surface and a new total light output factor of 78%! All RLM Dome Reflectors now being manufactured meet with these new high efficiency specifications.

This announcement is particularly important because it concerns the Dome type lighting reflector. This reflector because of its special characteristics and wide application for the Better Lighting of plants, warehouses, platforms, docks, etc., is the most frequently used reflector in modern industrial lighting.

Important factor in the popularity of the RLM Dome Reflector is the fact that it is an all-porcelain

enameled reflector. Porcelain Enamel's high lighting efficiency, high diffusion and light distribution, durability and long life have made it the most practical and most satisfactory of all known reflecting surfaces for most industrial lighting purposes. Porcelain Enamel Reflectors have been proven by decades of use. They are unaffected by atmospheric conditions obtaining over practically the entire range of industrial processes. Non-porous, easily cleaned and restored to original efficiency, fade-proof, and non-peeling, Porcelain Enamel Reflectors made in accordance with RLM Specifications assure not only highest lighting efficiency but lowest maintenance costs.

For a complete discussion of the four essentials of proper Light Conditioning assured by the RLM Label, (1) Balanced Lighting; (2) Low Cost Maintenance; (3) More Light at No Extra Cost and (4) Warranty of Uniform Quality, you are invited to write for a complimentary copy of the Booklet "The Meaning of the RLM Label."

The letters RLM stand for Reflector and Lighting Equipment Manufacturers



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If you sell Electrical Supplies, investigate the profit possibilities in Johnson Electric Motor Bearings—No obligation.

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Now you can use Carboloy cemented carbide—harder than the hardest steel—almost as hard as the diamond itself—to drill concrete, tile, brick, porcelain, etc. 50% to 75% faster. With this amazingly fast drill metal you not only cut drilling time at least in half but you also get up to 50 times longer life per each sharpening.

Carboloy Drill points—used in any rotary electric portable drill—are safe on fragile work, quieter operating, drill cleaner, more accurate holes, eliminate slow, monotonous chiseling. See your dealer or write direct for complete details.



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STOP WASTED KILOWATTS AND WASTEFUL SHUTDOWNS

the same type or trade designation.
5. See that brushes are in alignment and seat evenly.

6. Check spring tension and see that brushes do not stick in brush-holders.

7. See that brush-holders, studs and yoke are aligned and tight.

8. Inspect collector rings for cleanliness, grooving, pitting and eccentricity. Do the same for the commutator; also make observation for high mica, flat or high bars, loose segments, and loose armature coil connections. Use only sandpaper for cleaning commutator and fitting brushes.

9. Tighten loose connections, such as motor terminals, rotor field coils, slip rings, exciter armature and field terminals.

10. Check air gap, particularly on overhung exciter, to determine wear of motor bearing.

11. Protect motor, exciter and control from dripping water, falling objects and excess dust; provide a roof or an enclosure with ample ventilation.

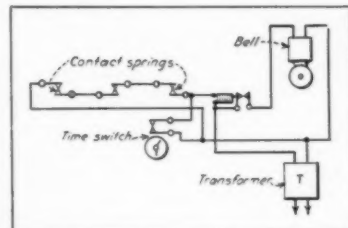
12. Inspect fuses and clips, contactor tips, switch blade clips, operation of overload relays and other control devices, and tighten all loose connections. See that enclosing cases for control equipment are in good order, that doors close properly.

Time Clock on Burglar Alarm

Q. What device may be used for automatically connecting and disconnecting a small local burglar alarm system at pre-determined times? Protection is desired on doors and windows at night. Protection is to be removed in the morning. Present system operates from a transformer.—A.G.

A. A spring-driven type time-switch such as is used for window lighting may be used for this purpose. The method of setting the switch will be different, however, as the circuit in this switch from night until morning will be on open-circuit instead of closed-circuit. On the other hand the switch will be on closed-circuit during the day.

The circuit for connecting the time switch is shown in the accompanying diagram. A small amount of current



BURGLAR CLOCK hook up to provide timed controls on an alarm system.

will pass through the locking relay at all times, in this type of a system. However, it is necessary to connect the time switch in this manner, because of the locking relay which would ordinarily be required to be reset manually.

Demon Organizer

L. J. Kane, superintendent of electrical maintenance of the South works, Carnegie Illinois Steel Company put on a record breaking one-man membership drive for the Chicago Electrical Maintenance Engineers.

With the help of A. L. Benner, electrical field foreman of the same company, Mr. Kane turned in 44 new membership applications to secretary M. R. Ely during the month of April.



CHATTANOOGA CONTRACTOR
W. A. Jewell of the Chattanooga Electric Co. maintains a large neon sign department. He finds the combination of electrical contracting and neon activities have placed him in a splendid position to handle lighting work with the new "power" or fluorescent powdered coated tubes.

Storeless Range Sales

Wiring and appliance sales are closely linked in the smaller towns of New York State. And this raises the problem of store overhead for many contractors. W. M. Anderson of Millbrook, N. Y., has no store but displays his line of refrigerators and ranges in the local power company office. He leads the county on range sales, regardless, and thereby keeps on top with his wiring crews as well.

A Woman Estimator

Engineering and contracting are usually considered "a man's job". But Mrs. E. Lane estimates and engineers wiring jobs for the Downes-Smith Co., electrical contractors of Stamford, Conn.

Competition doesn't bother Mrs. Lane. The \$70,000 contracting business they did last year shows that she usually gets the order.



Long Beam Floodlights



Dome Reflectors for Mercury Vapor



RLM Silvered Bowl Diffuser



Glass Steel Diffusers



RLM Standard Domes



Dustless Dome Reflector

QUAD

LIGHTING UNITS— PUT THESE UNITS TO WORK FOR YOU

TAKE ON MORE JOBS . . . MAKE THEM MORE UP-TO-DATE —EARN MORE INCOME

★ Quad Lighting Units are modern in every detail. They are high in lighting efficiency, easily detachable for cleaning, weatherproof—permanent porcelain enamel finish, easy to install—and you can always find the correct unit for any requirement. Contractors everywhere show their preference for Quad Units by installing them for new and replacement work in commercial and industrial installations both indoor and outdoor. They know they make up-to-date, good looking finished work and there's no after worries. Go after more lighting jobs with QUAD—they'll work for you and build up a good source of income. Write for more details or see your Wholesaler.

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In the News

WESTERN INSPECTORS APPROVE ARTICLE COMMITTEE REPORT

Recommendations of article sub-committees for changes to be applied in the forthcoming 1940 National Electrical Code were endorsed with a few minor exceptions, by the Western Section, International Association of Electrical Inspectors. This was at its 35th annual meeting in Hamilton, Ontario, September 11 to '13. Action on the Edison Institute proposals included recommendations for the use of thin wall insulation conductors of either rubber or other synthetic insulating material, and a rejection of "bare neutral" wiring systems.

The issue concerning the recommendations for the use of non-metallic sheath cables with uninsulated grounded conductors was obscured in parliamentary procedure. A motion to reject the article committee's favorable recommendation set off a heated discussion which was interrupted by a motion to "table" the original motion. The "tabling" motion was carried by a closely contested vote, which, in effect, removed the subject from further discussion at this meeting.

Because of the procedure employed by the convention of automatically ratifying article committee recommendations unless rejected by a majority vote of the delegates, the "tabling" motion was, in effect, a ratification of the article committee's proposal.

Against the somber background of war preparation, the Canadian hosts received their American guests with traditional courtesy and an extensive entertainment program. Registration figures totaled 340, and the convention heard addresses by several distinguished guests.

Dr. M. G. Lloyd, president of the International Association discussed the progress of the organization and of the National Electrical Code. He pointed out two important problems to be faced in future code work, a distinction between rural and suburban areas, and the question of quality standards in the National Electrical Code.

W. J. Donald, managing director of the National Electrical Manufacturers Association, urged close cooperation of all branches of the industry in the national promotional work that is now going on or planned for the immediate future.

A. R. Small, chairman of the NFPA Electrical Committee, told of the substan-

tial progress toward including safety provisions in the Code, guarding against injury and death hazards in electrical equipment and its installation.

S. B. Williams, editor of *Electrical World*, contending that the National Electrical Code is not a true minimum standard but a practical compromise of many divergent commercial interests, urged a positive approach to new wiring methods and a standard of minimum safety beyond which better wiring could be sold.

J. R. Catterall of the Hydro-Electric Power Commission of Canada discussed several code problems common to Canada and the United States.

The normal succession of officers took place, James Galbraith of Detroit was elected president, J. B. Wilkinson of Milwaukee, Wis., first vice-president; L. J. McCormick, Kansas City, second vice-president and F. H. Moore, Indianapolis, secretary-treasurer.

Executive committee members elected were, J. E. Miller, Hugo Ries, D. J. Talbot, G. W. House, V. C. Moulton, R. D. McDaniel and L. P. Dendel to serve for the coming year.

COUNCIL SETTLES CHARLESTON CONTROVERSY

A dispute between the electrical contractors of Charleston, West Va., and the local union was arbitrated by the Council on Industrial Relations on Sept. 8, sitting in a Washington club. The case involved four issues—1. The contractors complained that members of the local union were contracting for work. 2. The contractors complained that in reviewing the local contract the union proposed a rotation of workers neither limited in number nor subject to the approval of the employer. 3. The union complained that whereas their agreement with the contractors called for travel and board expense to be paid to workers on distant out of town jobs for the first three weeks of work, contractors were lumping trips of one or more days, perhaps 30 or 40 miles away, to accumulate the three weeks. The union wanted the men to be paid for this extra expense, except after three consecutive weeks work. 4. The union demanded an increase in the local wage scale from \$1.25 to \$1.50 an hour, retroactive to April, 1939. The reason was that the local union had accepted a voluntary decrease in wages from \$1.25 to \$1.00 in 1932, which was restored when times improved. Present scale dates back to 1929.

Both sides presented briefs and the local union was represented by its business manager. The local contractors were not represented. The council ruled that—

1. Union members should not contract for work. 2. Rotation should be restricted to not more than half the journeymen and helpers to be selected with the cooperation of the contractor. 3. Period of expense payment on distant out of town work to mean three consecutive weeks.



SOME SCENERY from the recent meeting of the IAEI Western Section at Hamilton, Ontario. 1. Earl Nelson right, who doubled the membership in three years, receives congratulations from L. J. McCormick and Ben Clark. 2. L. E. Felt and Carl Mason demonstrating a test at the Michigan exhibit. 3. Busy host, G. W. House of Hamilton, who put on the show. 4. IAEI officers, F. H. Moore (left), secretary-manager; L. P. Dendel, Lansing, retiring president; James Galbraith, Detroit, new president; J. B. Wilkinson, Milwaukee, first vice president; and L. J. McCormick, Kansas City, second vice president. 5. Here we have posed, an argument by A. T. Babbitt and F. O. Evertz with Lloyd Branch acting as umpire.

There is Profit in Teletalk

WEBSTER ELECTRIC

Amplified

Intercommunication

REG. U. S. PAT. OFFICE

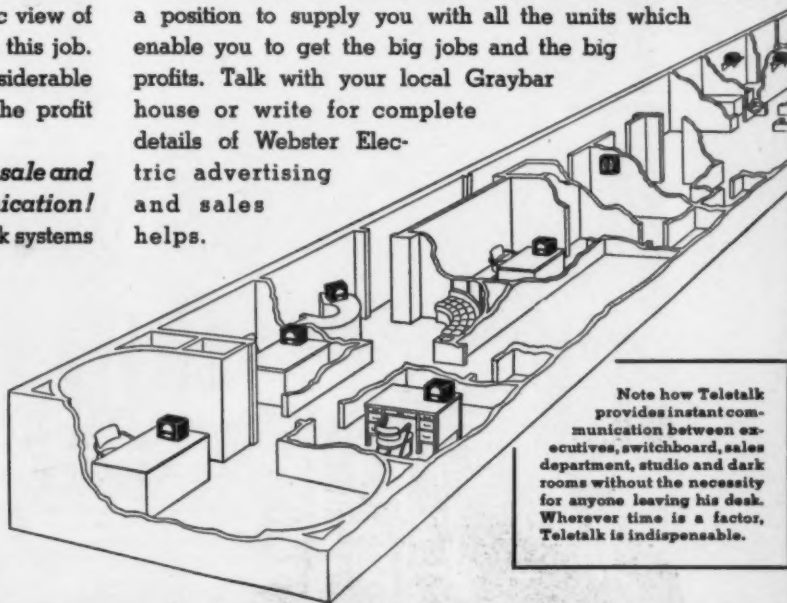


... and You Make Additional Profit in Installations Like This!

The illustrations above show some of the stations in a ten-station Teletalk system recently installed in a nationally known photographic studio . . . and shown below is a diagrammatic view of the entire installation. . . . There were three profits on this job. The profit on the sale of Teletalk. The profit on a considerable quantity of ten-pair cable and junction boxes. And the profit on the labor involved.

There is plenty of profit for the contractor in the sale and installation of Teletalk amplified intercommunication! And there is no limit to the sales opportunities. Teletalk systems can be sold to doctors, lawyers, stores, offices, factories, and lumber yards—everywhere that there is a need for saving steps and time; wherever people want to get things done faster. . . . Furthermore, in addition to various models of Teletalk that are available for intercommunication alone, Teletalk makes it possible for you to sell larger systems which em-

body paging, signalling—all in one compact system. . . . This is a rapidly growing market and only Webster Electric is in a position to supply you with all the units which enable you to get the big jobs and the big profits. Talk with your local Graybar house or write for complete details of Webster Electric advertising and sales helps.



Note how Teletalk provides instant communication between executives, switchboard, sales department, studio and dark rooms without the necessity for anyone leaving his desk. Wherever time is a factor, Teletalk is indispensable.

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Cable Address: "ARLAB", New York

Webster Electric



"Where Quality is a Responsibility and Fair Dealing an Obligation"



[FROM PAGE 88]

4. Wage rate to be raised to \$1.37½ an hour as of Sept. 15, which is even with other comparable local trades.

This settled in a half day, a local controversy which has been disturbing conditions in Charleston for a long time. Chairman L. K. Comstock presided.

SLATTERY NOW HEADS REA

Harry Slattery, under secretary of the Interior Department, has been appointed by the President as administrator of the Rural Electrification Administration. He succeeds John M. Carmody, now heading the Federal Works Administration.

Mr. Slattery has been a familiar figure in Washington since 1909, when he became secretary to Gifford Pinchot. He has been an advocate of public power ownership, closely identified with the Norris-Ickes-Rankin conservation of national resources group, and has played a part in practically every major conservation and power fight for years. He collaborated in drawing up the act creating the Rural Electrification Administration which he will now administer. He was at one time closely associated with Morris L. Cooke, first REA boss. He is a lawyer



HARRY SLATTERY

and has been a behind-the-scenes worker during most of his career in Washington.

When Pinchot was ousted from the Forest Service, Slattery became secretary and later counsel to the National Conservation Association. In 1918 he was special assistant to Secretary of the Interior Lane. His next official post was as Secretary of Interior Ickes's personal assistant, until he became under secretary.

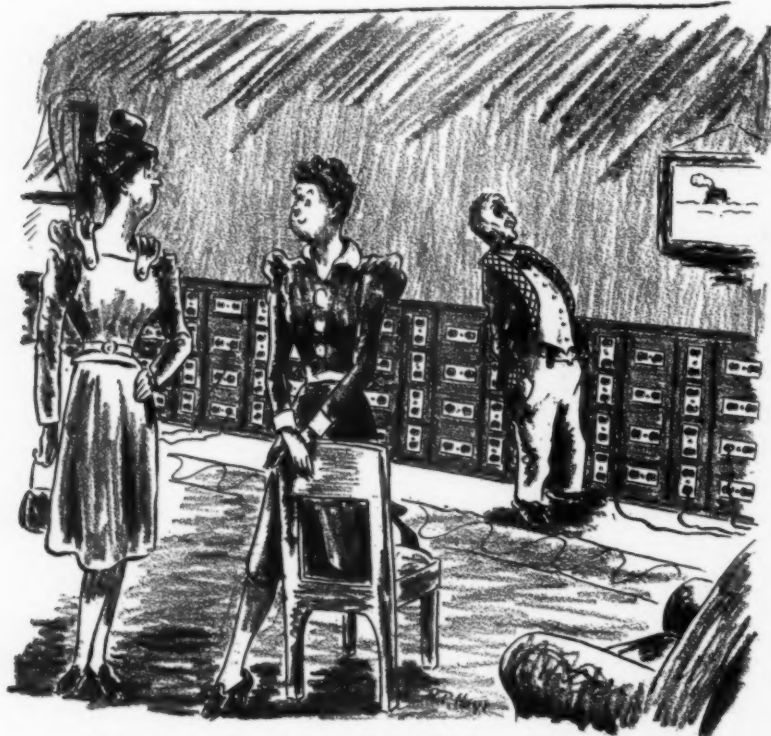
Suave and soft-spoken, Slattery can be "tough" when necessary. Faced with a degree of internal dissension within the REA, the new administrator has "no illusions" about his assignment. He realizes that the REA program is not operating just as he would like, and is prepared to take strong steps to correct what administrative defects he finds.

SOUTHERN INSPECTORS OK THIN INSULATION

Thin wall insulation for building wire was heartily endorsed by the Southern Section of the International Association of Electrical Inspectors, meeting in Asheville, N. C., September 18 to 20. However, the reviewing committee reported that "the data submitted by the Edison Electric Institute on bare neutral and covered neutral is not sufficient to convince a majority that these methods of wiring are safe." All the other EEI proposals, therefore, were disapproved by the Section.

This convention turned out an unusually large attendance. Meetings were held at the George Vanderbilt Hotel. Prominent speakers were International President M. G. Lloyd, M. M. Brandan speaking on panelboards, A. R. Small of Underwriters Laboratories and Arthur L. Abbott of NEMA. The program included the usual review of experience under the Code with recommendations, article by article.

New officers elected for the coming year are C. S. Whitaker, Durham, president; Frank G. Camus, Shreveport, first vice president; W. A. Stall, Jacksonville, second vice president; and Joseph Whitner, Atlanta, secretary and treasurer. Executive committee is—D. L. Johnson, Atlanta, chairman; P. L. Muller, New Orleans; A. E. Hancock, Austin; L. A. Turnage, Hartsville. Executive Council is H. N. Pye, Atlanta; N. E. Cannady, Raleigh; George Welman, New Orleans; and E. A. Thibodeaux, Thibodaux. The next meeting will be held in Houston.



It's our dream house. We never had enough places to plug in appliances.

NEW PERSONNEL OF INDUSTRIAL RELATIONS COUNCIL

The Industrial Relations Council for the Electrical Construction Industry has announced its new personnel, as reorganized. The Council, in August, transferred from the temporary sponsorship of the Electrical Conference Club, to that of the IBEW Employees Division of the National Electrical Contractors Association. The membership now is—

Employer Members

- L. K. Comstock, Chairman of the Board L. K. Comstock & Co., New York
- E. C. Carlson, President, Carlson Electric Co., Youngstown, Ohio
- Clyde L. Chamblin, President, California Electrical Construction Co., San Francisco, Calif.
- Robert W. McChesney, President, Harry Alexander, Inc., Washington, D. C.
- J. N. Pierce, President, Pierce Electric Co., Chicago, Ill.

Employee Members

- D. W. Tracy, International President of I.B.E.W.
- G. M. Bugnizet, International Secretary, I.B.E.W.
- M. H. Hedges, Director of Research, I.B.E.W.

M. P. Gordan, Member International Executive Council, IBEW, Pittsburgh. The fifth member appointed to represent IBEW was Charles L. Reed, assistant to the International President, who died on August 9. His place on the committee has not yet been filled.

Mr. Comstock is chairman and Mr. Hedges is secretary of the Council.

A.W. MEN TOGETHER IN CHICAGO

Patterned after the recent successful Pacific Coast Regional Conference, the second gathering of those interested in local Adequate Wiring Bureau work in Chicago, September 21-22, brought together 70 men from 19 cities of the north central region. Plans for putting over adequate wiring programs in new homes, and rewiring old homes were presented and discussed.

These included the successful Chicago Red Seal experience, the Milwaukee graded wiring system plan, Omaha's CNX program, and exceptional features developed in other cities. Key problems cited are (1) developing presentation material to aid the contractor in telling his story to the customer, (2) developing local information sources for early leads on proposed building or rewiring activities, and (3) increased field representation from the N.A.W.B. to support local groups.

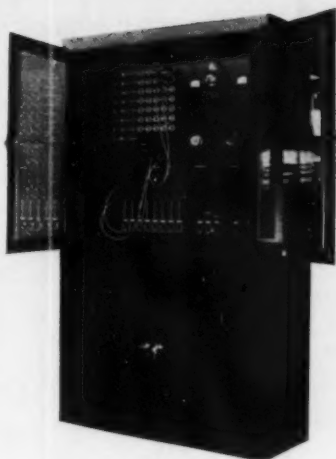
Recognizing the electrical inspector's important place in wiring development of rural areas, the conference urged that the electrical inspector be incorporated in the sponsorship of the Adequate Wiring program. The gratifying cooperation of many electrical contractor groups primarily concerned with commercial and industrial work was acknowledged by the conference. A resolution was passed urging a national program for adequate wiring in the commercial and industrial fields.

The Chicago Electric Association Red Seal campaign was presented by A. A. Gray and Carl E. Heimbrod. The graded wiring system technique adopted in Milwaukee was discussed by F. F. McCoy and B. H. Barg. A method of computing wiring adequacy by a numerical score based on number of outlets and copper capacity with respect to the floor area was presented by Charles V. Dunn of Kansas City.

Discussions were led by General Chairman W. A. Ritt, secretary-manager of the North Central Associated Electrical Industries of Minneapolis, assisted by A. A. Gray, Chicago; A. E. Schanuel, National A. W. Bureau; F. F. McCoy, Milwaukee; A. C. Crandall, Indianapolis; H. P. Wilson, Rock Island; and Carl H. Christine, St. Louis.

INGALLS JOINS NECA LABOR COM.

W. W. Ingalls, president of the Ingalls Electric Company of Miami, has been elected a member of the NECA Labor Relations Committee from District No. 5. He succeeds D. B. Clayton, who recently resigned from this committee.



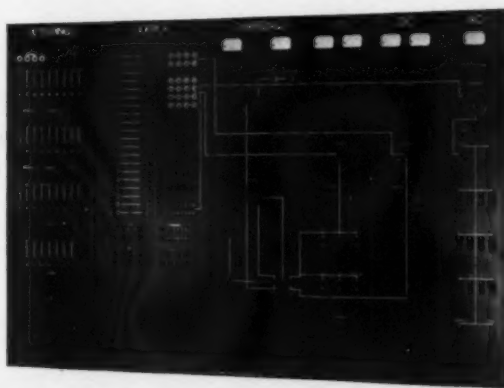
*Experimental Switchboard
Enclosed Type*

INDUSTRIALS, SCHOOLS AND COLLEGES ARE IMMEDIATE PROSPECTS FOR WURDACK EXPERIMENTAL LABORATORY SWITCHBOARD AND PANELBOARD INSTALLATIONS

WURDACK Experimental Laboratory Switchboards and Panelboards can be furnished for any size or kind of Science Laboratory where electrical energy of various forms and voltages is used for experimental or research work. All plugs and jacks, and many of the other special parts required for the construction of these parts, are of our own design and manufacture, making it possible to maintain a continuous high standard of quality and performance. In addition to the switchboards and panelboards, we are also in position to furnish the many special outlets or service panels required in connection with a complete laboratory electrical system. Mail the coupon below for more detailed information.

Experimental Switchboard—Open Type

WURDACK also makes a complete line of panelboards, circuit breaker panels, distribution panelboards, and remote control stage switchboards. Simple design and rugged construction of all WURDACK products aid you in producing finished work that gives satisfactory service with no after worries for you. There's always the right size and design for the job when you use WURDACK.



Wm. WURDACK ELECTRIC MANUFACTURING COMPANY

4444 CLAYTON AVE.

ST. LOUIS, MISSOURI



Please send details on

- ☐ Switchboards, Experimental—enclosed type
- ☐ Switchboards, Experimental—open type
- ☐ Switchboards, live front or dead front for light and power distribution
- ☐ Theatre Switchboards of manually operated semi-remote or full remote control types
- ☐ Panelboards, dead front, fusible or circuit breaker types for all applications

Name.....

Address.....

City..... State.....



(Listed by Underwriters' Laboratories)

McGILL All-Purpose Wood-Handle Guards are safe from shocks . . . they stand up well around grease and oil and may be easily washed with no ill-effect upon the wood handles. They have come into more

prominence in the last few years . . . the steel and shipbuilding industries, and railroads standardized on them many years ago. For further information, see your wholesaler or write to us.

McGILL MANUFACTURING COMPANY

Box 670 • VALPARAISO, INDIANA

CORNELL-DUBILIER CAPACITORS

1939
CERN 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

CORNELL-DUBILIER ELECTRIC CORPORATION

1048 Hamilton Boulevard, South Plainfield, New Jersey

Send for your copy TODAY

In the News

[FROM PAGE 91]

MICHIGAN LAW DECLARED VOID

The Michigan State Electrical Law was declared unconstitutional by the State Supreme Court on September 4. In reversing the action of a lower court in a suit brought by an electrical contractor against the State Board, a divided bench held that the Michigan Electrical Law was unconstitutional in three points—

1. The legislation was discriminatory in that it did not apply to electrical utilities.
2. Legislation was discriminatory in that it applied to generating plants under 10 kw. only.

3. The National Electrical Code was included in the law by reference, which the court held to be an illegal delegation of legislative authority.

The Attorney-General's office has appealed for a re-hearing. This, however, can only be accomplished with the court's permission. Interested groups are already preparing a revised law for consideration by the legislature at a special session to be called soon.

This action finishes the Michigan Electrical Law after a year of political persecution, according to a statement by L. P. Dendel, former Board member of Lansing, Michigan. On July 1, 1938, appropriations for the maintenance of the State Board were radically reduced. In December 1938 an inspector who had been fired by the Board protested to the governor who turned his protest over to the Auditor General. The Auditor General reported that the trouble was solely due to lack of finance and that a bill was before the legislature to improve the condition.

Some time later a repeal bill was introduced, but died for lack of support. Another bill was introduced to eliminate the inspection department, requiring utilities to provide inspection at no charge. After the death of former Governor Fitzgerald the same disgruntled inspector wrote a similar complaint to Governor Dickinson, who turned the complaint over to Attorney General Read. Read found some technical violations of the law and demanded the resignation of the members of the Board.

The Board corrected the technical violations and resigned. The Attorney General later conceded that he was unable to find any evidence of dishonesty or improper conduct by members or employees of the Board. But the unfavorable publicity created by the charges remained unanswered, as the members of the Board were given no opportunity to defend themselves.

A special session of the legislature to meet within the next few months will be asked to consider new legislation to revive the Electrical Administrative Board, correcting the defects in the previous law which resulted in its rejection by the court.

COMING MEETINGS

International Association of Electrical Inspectors—Eastern Section, Providence, R. I., Oct. 2-4.

International Association of Electrical Leagues—Fourth Annual Conference, Auditorium of Electrical & Gas Association of New York, Inc., Grand Central Palace Building, New York, Oct. 4-8.

National Electrical Contractors Association—Annual Convention, Bellevue-Stratford Hotel, Philadelphia, Pa., Oct. 9-12.

National Electrical Wholesalers Assn.—Semi-Annual Convention, Hotel Gibson, Cincinnati, Ohio, Oct. 16-20.

National Electrical Manufacturers Association—Annual Conference, Palmer House, Chicago, Oct. 23-27.

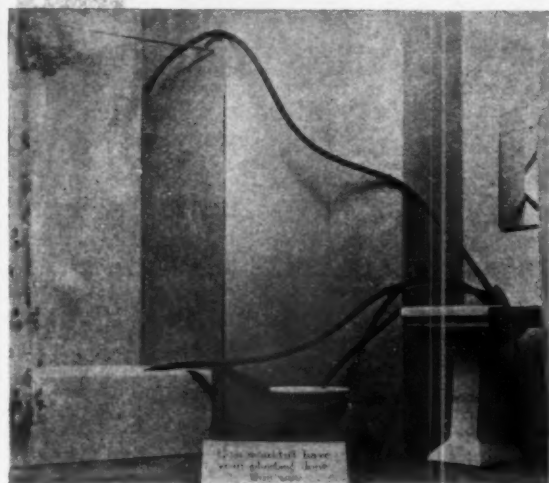
REA OFFERS

NEW LIMITED SERVICE

REA has launched a plan for connecting farmers to existing cooperative or private power lines on a minimum charge of \$1 a month by using low capacity transformers. Minimum charges have heretofore ranged from \$2.50 in the south to \$4 in the north.

The new transformer has a capacity of 600 watts. Through the cooperation of several manufacturers with REA, it will cost \$21 for the first 10,000. Economies have been introduced by using a bakelite case instead of metal and a new combination conductor and ground that costs 3 cents a foot. The farmer is expected to dig the trench from the transformer pole to his house and fill it in. Also REA has purchased new circuit breakers from Heinemann Electric Company to use with these transformers at a cost of \$3 for the first 10,000.

REA expects to use this new plan to introduce electric service to farmers who will not or cannot pay the present minimum. But the new transformer will carry no more than a flatiron or radio and a few lights at one time. It therefore will not be adequate for normal domestic use under modern standards.



YOU WOULDN'T
—This striking parallel was featured at the recent Western Idaho State Fair in Boise, by the Idaho Power Co. It was a show window effect contrasted with a similar window featuring a miniature living room with the appliances connected by trailing flexible cords. Models of modern bath room fixtures were shown here, with rubber tubing to carry the water to the tub and toilet.

THIN INSULATION ON PACIFIC COAST

Last month, news of the meeting of the Pacific Coast Section of the International Association of Electrical Inspectors reported here that the action of the Article Committee in endorsing thin wall insulation for approval in the next Code had been supported. Such action was taken. But late in the meeting, we learn, this subject was reopened and the vote was reversed. The final action of the Far Western inspectors, therefore, was to oppose the approval of thin insulation by the Electrical Committee.

N. J. CONTRACTORS LAUNCH LABOR BOARD

The Electrical Contractors Association of New Jersey has recently organized an Electrical Conference Board to promote cooperation between the employers of union labor and their employees. On this board, Joseph Buhl, Ernest Jarvis and Edward J. White represent the contractors association, and Edward Schroeder, William Franz and Carl Wrege represent the Union.

The Board hopes to create more work for the contractor, with a consequent need for more labor. For example, the FHA housing program provides a wide market and the Board has arranged to lower the wage rate for this type of work. The procurement of maintenance work in industrial plants, commercial buildings and apartment buildings and the settlement of jurisdictional and wage and hour disputes without costly strikes, are other problems this group will try to solve.

STAMFORD CONTRACTORS REVOLT

The electrical contractors of Stamford, Connecticut, were faced with the time worn problem of direct jobber competition. Local jobbers continued to sell to



Improved PAINE CABLE CLAMPS

For use on cross arms, overhead beams, poles, etc. The Paine patented slot is a time and money saver because it aids installation—no fumbling or guesswork—merely slip the bolt with the nut already on into the slot and tighten. Lag Screw is gimlet pointed, and anti-rust clamp is hot-dip galvanized for rust resistance.

PAINE "Snugfit" PIPE HOOK



Covers a greater circumference of the pipe than any other—tight close fit assured and slipping and turning of pipe is prevented. Paine Pipe Hooks permit installation and carrying of pipe in awkward, hard-to-get-at places.

PAINE Hanger Ring & Bolt



15 sizes—a size and type for every purpose and pipe. Smoothly finished, no rough burrs or uneven edges. Fits pipe snugly, providing absolute support and anchorage. Fitted with Paine precision threaded bolt and nut.

PAINE BX STAPLES



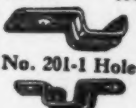
Ideal for use in supporting BX cable running along side walls. Conforms accurately to BX Cable shape. A small item, but a virtual necessity in every electrical kit.

PAINE Pipe Strap



Prominent bead or center rib provides added strength to the Paine Pipe Strap. Uniform gauge materials, accurately stamped screw holes, smooth finish, make this the preferred pipe strap. Snug, form fitting sturdy, dependable, conforming in every detail to Paine quality workmanship and materials.

PAINE ONE and TWO HOLE ROMEX STRAPS



No. 201-1 Hole



No. 201-2 Hole

For use in supporting sheathed cable. Has the prominent center bead or rib that adds extra strength to strap. Write TODAY for complete Paine catalog of Electrical and Installation Specialties and Anchors.

THE PAINE COMPANY

2961 Carroll Ave., Chicago, U. S. A.
New York Office—48 Warren St.
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MINERALLAC HANGER



Conduit $\frac{3}{8}$ "— $2\frac{1}{2}$ "
Cable to $2\frac{1}{8}$ " (with Bushings)

Cadmium and Everdur
MINERALLAC JIFFY CLIP



Sizes from .250" O.D. Tubing
to $1\frac{1}{4}$ " conduit.

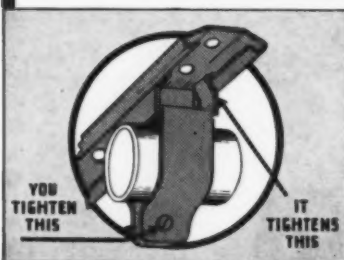
See your Jobber

New York City Office
Theodore B. Dally
50 Church Street

MINERALLAC ELECTRIC CO.
25 N. Peoria St., CHICAGO

With Only One Screw
to Tighten . . .

THE CLEVELAND CONDUIT HANGER



Gives You a Quicker
Easier Installation

"CONVINCE YOURSELF"

"Send for Circular
Giving Full Details"

THE CLEVELAND SWITCHBOARD CO.
2927 E. 79 St. Cleveland, Ohio

In the News

[FROM PAGE 93]

the consumer at contractor's prices. To make matters worse—the contractor was invariably called in to install this material.

What formerly was a smoldering spark finally burst into flame. The contractors decided to do something about it. They banded together and refused to install material sold on this basis. And it worked.

The local jobbers sat down with the contractors organization and both sides laid their cards on the table. The net result was an agreement whereby the contractors are protected on any future direct jobber-consumer sales.

HART OUT OF NECA

Monte E. Hart, president of Hart Enterprise Electrical Co., Inc., of New Orleans, has resigned as member of the executive committee of NECA for District No. 8, and as a member of the Labor Relations Committee. This followed Mr. Hart's recent conviction, with four others, in the Louisiana State University scandal.

CHICAGO LIGHTING SCHOOL

The 1939 Lighting School of the Chicago Lighting Institute will be held October 11-13. On Friday there will be a conference on commercial, industrial, and residential lighting, concerned with advanced problems of lighting application.

These sessions are open to electrical contractors, lighting specialists for utilities or electrical wholesalers and any one interested in the manufacture, design, sale or installation of modern lighting equipment.

NEW CODE FOR LOS ANGELES

After four years of revision, Los Angeles' new electrical code is about to be issued. It becomes effective 120 days after signature by Mayor Fletcher Bowron, on Aug. 24.

The new code has been developed by a committee of contractors, manufacturers, utility engineers and inspectors selected by the Electrical Development League of Southern California from the associations in the industry. It contains some innovations in respect to circuiting permitted for feeders to several air heaters, and new concepts in appliance circuit arrangement.

SAN FRANCISCO GROUP TIES IN

The San Francisco Electrical Contractors Assn., Inc. has voted to reaffiliate with the national association and seek a chapter charter. Until last year NECA operated in northern California through the Northern California chapter. When national dues were changed, it reorganized as the Electrical Contractors Assn. of Northern California, urging all of its members to affiliate with NECA as individuals.

OMAHA SECRETARY DIES

J. P. Brown, retired electrical contractor, of Omaha, Nebraska, and secretary of the Omaha Electrical Contractors Association, died on September 8 at the age of 73.

WITH THE Manufacturers

B. W. Bullock New Advertising Manager

Boyd W. Bullock has been appointed advertising manager of the General Electric Company appliance and merchandise department at Bridgeport, Conn. He has been with the company for the past 17 years and since 1933 has



BOYD W. BULLOCK

been assistant manager of the publicity department.

Mr. Bullock will make his headquarters in Bridgeport, and will direct the advertising and promotional programs for G. E. products sold to consumers through retail channels with the exception of heating and air conditioning products.

Cutler-Hammer, Inc. has expanded its motor and central service in the Colorado territory. The Denver office has taken on additional trained personnel, to handle increased facilities and stocks.

Allis-Chalmers Changes

Allis-Chalmers Mfg. Company, Milwaukee, has opened a new branch office in the U. S. Trust Bldg. at Louisville, Kentucky. W. E. Kercheval will be in charge.

A new branch office has also been established at LaPorte, Ind. B. L. Margeson, formerly in charge of the company's Rockford, Ill., office, will be in charge. J. J. Breutzman, formerly at the Chicago office, will succeed Mr. Margeson at Rockford.

A. B. Frost has been appointed branch manager at the New Haven, Conn. office to succeed E. D. Hill, who resigned due to illness.

Walker Electrical Company, Atlanta, announces the erection of a new branch plant off Northside Drive in Atlanta. This is being used for the production of a complete line of outlet and switch boxes, bar hangers, clamps, lath supports, extended ears and other miscellaneous accessories for these boxes. This is a new field of production for the company.

McGill Manufacturing Co., Valparaiso, Ind. announces the appointment of Robert C. Purdy as direct manufacturers' representative. Mr. Purdy will make his headquarters at Cleveland, Ohio.

The Standard Transformer Co. of Warren, Ohio announces the appointment of Frank L. Frable, 100 W. Monroe St., Chicago, to represent them in Illinois, southern part of Wisconsin and northern Indiana.

Diesel Power Co., 306 East 4th St., Tulsa, Okla. has been named to represent them in the state of Oklahoma.

More Gossip

Clayton's Company Name

D. B. Clayton has just changed the name of his Birmingham company from Mill and Mine Construction Company to Electric Constructors, Inc. He continues his activities in the field of industrial and commercial wiring.

Neat Shop

One of the most attractive estimating offices in the Mid-South belongs to the Wilhelm & Schnur, electrical contractors of Louisville, Ky.

The single large room extends over most

of the second floor with daylight on two sides plus a good lighting installation. Walls and ceilings are finished light, drafting tables line the walls adjacent to the windows. Filing and tracing drawers keep job papers conveniently.

Piecemeal Modernization

Just because a whole modernization job costs too much need not stymie business. A Newark, N. J., university is gradually being re-wired room by room, from detailed layouts of each area. When the E. J. White Co. made its survey, about forty separate layouts and estimates were made on this basis. Result, a steady flow of re-wiring orders over a period of several years, sized to fit the customer's ability to pay.



RESIDENCE WIRING is not a very large part of the activity of Wilhelm & Schnur, commercial and industrial electrical contractors of Louisville, but, according to Robert Schnur, a recent residential job set something of a record in electrical adequacy.

Service conductors consisted of three 500,000 circular mil conductors and the wiring system required 130 branch circuits. Several of the rooms have elaborate systems of cove lighting.

Public Thanks

Clifton W. Whitmore, of Lord Electric in Miami, sends in an advertisement torn from a local newspaper. In it, Dade Pharmacies thank Lord Electric for "installing the best electrical installation in Miami in our new store." Lord Electric paid for the ad and Dade signed it.

Fowler Heads Memphis Housing Authority

Popular J. A. Fowler of Fowler Electric Co. of Memphis, Tenn. now devotes practically all his time as chairman of the Memphis Housing Authority, which is erecting several Federal Housing Projects. He still finds time, however, to take an active part in the activities of the Memphis Electrical Contractors Association.

SURFOLETS

No. 8400. This base standard under all Surfolet outlets

No. 8460 Pull Chain Lamp Base

No. 8420 Keyless Lamp Base

No. 8410 Tumbler Switch

No. 8430 Duplex Flush Receptacle

No. 8440 Rosette

No. 8450 Blank Junction Box



**give you distinct
"Sales Clinching"
advantages on
Surface Wiring Jobs**

Surfolets are the latest and most modern development in surface wiring devices. Their neat, white porcelain bodies, attractive modern design and sturdy construction provide unusual customer appeal and are effective sales clinchers.

Installation is made in almost half the time necessary for conventional outlets and thus offer contractors real sales and profit possibilities.

Underwriters' approval is assurance to the customer of complete safety and protection.

Write for full details, TODAY.

PORCELAIN PRODUCTS, INC.

FINDLAY, OHIO

EQUIPMENT *News*

Magnetic Switch

A new Size O a.c. magnetic switch has been developed. Available for use with single-phase motors up to 1 hp., 110 volts, and 1½ hp., 110 volts and 2 hp., 220-600 volts. Made in 2-, 3-, and 4-pole forms, it is available in general-purpose, dust-tight and water-tight cases. Also available with push-button or selector switch, in cover, for local operation. Magnet of switch is E-type with three sealing surfaces. Overload relay is completely enclosed and tamperproof. General Electric Co., Schenectady, N. Y.



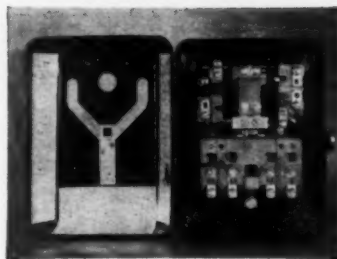
G.E. MAGNETIC SWITCH

Reflector

The Ivanhoe coffer type reflector for the silvered bowl mazda lamp was designed for an installation having a low ceiling. Unit recesses in ceiling, provides broad distribution of light. It is of spun steel with inner reflecting surface of semi-matte white porcelain enamel. Socket for 500 watt lamp is held in standard 4-inch outlet box attached to reflector. There are eight holes in flange of reflector for mounting to ceiling. The Miller Co., Meriden, Conn.



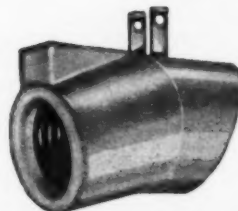
MILLER REFLECTOR



WESTINGHOUSE LINESTARTER

Linestarter

A small, inexpensive across-the-line starter has been developed for ratings up to two hp., 220, 440 and 550 volts, two- and three-phase and equivalent ratings on single-phase. Used for across-the-line starting of squirrel-cage induction motors and as primary switches for wound-rotor induction motors. Available as plain starters or in combination with motor circuit switches and Nofuze circuit breakers in standard enclosures. Principal features include De-ion arc quenching and snap action bi-metal disc overload relay. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



NATIONAL ANGLE SOCKET

Angle Socket

Angle socket No. 971-1 has been added to the "Plug-In" strip line. Factory-made 6-inch spacing guarantees uniformity and eliminates careful measurement. Luminaire, tubular and standard shaped lamps may be interchangeably used and lighting arrangements changed at will. Socket accommodates standard lamps from 15 to 100 watts. National Electric Products Corp., Fulton Building, Pittsburgh, Pa.



CONNECTICUT TELEPHONE SIGNAL BELL

Electric Signal Bell

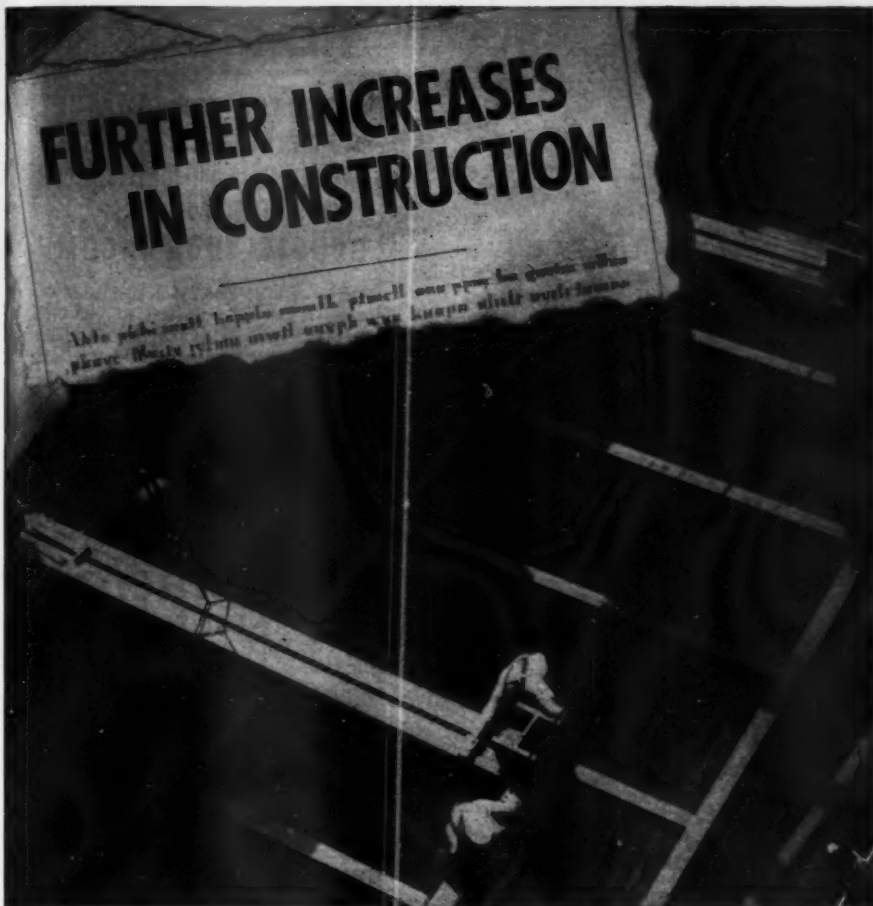
A new type of electric bell which can be attached to an outlet box to operate on the 110 volt circuit. For use as fire, burglar, sprinkler, vault and general signal alarm bell. Made for both a.c. and d.c. high and low voltage systems. Sizes range from 4 to 16 inches. It features completely enclosed air-sealed Alnico-magnet motor, simplified striking mechanism of one moving unit—the plunger, and a detachable back plate with a receptacle which can be mounted on any standard outlet box. The bell unit, can be plugged into this receptacle. The Connecticut Telephone & Electric Corp., Meriden, Conn.



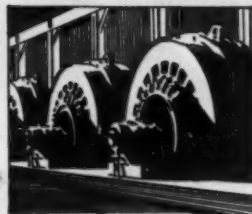
SQUARE D AUTOMATIC STARTER

Starter

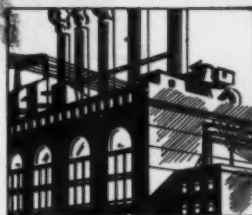
New Size O, Type R, Class 8536 starter has been developed for smaller sizes of polyphase and single phase motors. Maximum polyphase ratings are 2 hp., 220, 440, 550 volts; maximum single phase ratings are 1 hp., 110 volts or 1½ hp., 220 volts. Has a vertically operating magnet, double break silver contacts and thermal overload relays. Available with general purpose, dust-tight, water-tight or Class II, Group G enclosures; also as combination starter with either disconnect switch or circuit breaker; also in reversing type. Square D Company, 6060 Rivard St., Detroit, Mich.



PARKWAY CABLES



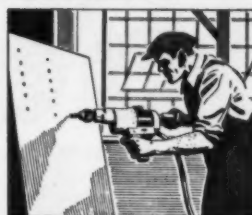
VARNISHED CAMBRIC CABLES



AMERBESTOS CABLES



SERVICE ENTRANCE AND
DROP CABLES



AMERCLAD CORDS & CABLES



TREE WIRE

... and More Satisfied Users of AMARINE-30

AMARINE-30 building wires and cables with braided coverings are approved by Underwriters' Laboratories for installation underground; in concrete slabs or other masonry in direct contact with earth; in permanently moist locations; and where the condensation and accumulation of moisture within the raceway are likely to occur. Ordinarily, installations of these types would call for the use of lead-sheathed cables. Wherever such conditions exist AMARINE-30 can be employed safely and at worthwhile savings.

Other outstanding building wires of the highest quality are:

Americore (Code)
Amerite (30% Performance)
Amperox (Heat-Resistant)

All of these products are manufactured by the American Steel & Wire Company and are made under rigid supervision. Superior quality and satisfactory service have made them the choice of the building industry. Write for data.



AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago



and New York

Columbia Steel Company, San Francisco, Pacific Coast Distributors

United States Steel Products Company, New York, Export Distributors

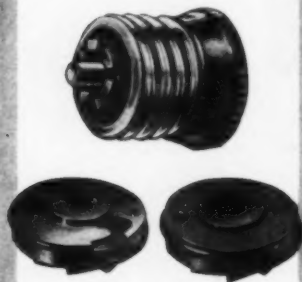
UNITED STATES STEEL

New G-E DEVICES FOR MODERN WIRING



1. TWIST-TITE OUTLETS

These outlets will please your customers. Plugs cannot be pulled out accidentally. Vibration will not loosen plugs or cause them to fall out. These outlets will accommodate any standard parallel-blade plug. A slight twist after plug is inserted keeps it tightly in place. Approved by Underwriters. Available in brown or ivory.



2. TAMRES PLUG FUSES

G-E Tamres tamper-resisting plug fuses will serve a dual purpose: as a standard plug fuse without the adapter or as a tamper-resisting plug fuse with the adapter. This double characteristic enables you to serve all customers from one stock. G-E Tamres fuses are available in 15, 20, 25 or 30 amp. capacity. Adapters for these fuses are available either with or without a locking spring. G-E Tamres plug fuses have standard medium Edison bases and will fit any standard fuse holder or cutout.

For further information about G-E Twist-Tite outlets or G-E Tamres Plug fuses see the nearest G-E Merchandise Distributor or write to Section D-9410, Appliance and Merchandise Dept., General Electric Company, Bridgeport, Conn.

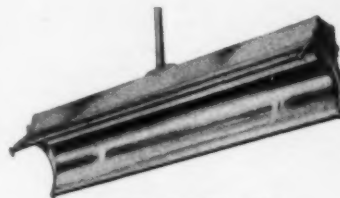
GENERAL ELECTRIC

EQUIPMENT *News*

[FROM PAGE 96]

Fluorescent Lighting Unit

The "Knit-Master" fluorescent unit is designed for lighting the needle bar and work area of full-fashioned hosiery machines. It uses a 30 watt, 36-inch daylight fluorescent lamp in a special angle type reflector. Complete fixture consists of specular reflector, sockets, auxiliaries, hinged wiring channel and a flange for pipe mounting. Each unit has flanges for conduit suspension, as well as 1-in. knock-outs at each end of channel. Wheeler Reflector Co., 275 Congress St., Boston, Mass.



WHEELER LIGHTING UNIT

Multi-Breaker

This new type MO multi-breaker is designed for use in the home, shop, commercial building or farm. It functions as an entrance or service switch with overload and short circuit protection on lighting circuits, oil burners, stokers, water heaters, refrigerating units, air compressors, air conditioning equipment, electric unit heaters, laundry appliances, small workshop tools, feed grinders, drill presses. Rating is 15 to 25 amperes. Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee, Wis.



CUTLER-HAMMER MULTI-BREAKER

RE-MO-LITE

MAKE THE MOST OF THE OPPORTUNITIES OFFERED BY RURAL COMMUNITIES FOR LIGHTING THAT— BOOSTS YOUR INCOME

★ Here's a potential source of good income for alert Contractors. RE-MO-LITE is the only remote-controlled yardlight on the market and comes complete with 2 switches, lag bolts, service screws, and instructions. Simple and easy to install—saves wire, labor, and material. Specify RE-MO-LITE for customer safety, convenience, and satisfaction. Ask about our free trial offer—make more money for yourself.

**Twentieth
CENTURY ENGINEERING CO.**
MANKATO, MINNESOTA



**4
SCRULUGS**

Take 20
WIRE and CABLE
SIZES

ALL
SCRULUGS
ARE TIN-
PLATED

Type
KPA

BURNDY ENGINEERING CO., INC.
459 E. 133 St., N. Y. C.

Fluorescent Lighting Unit

Fluorescent lighting unit, called Hygrade HF-100, is for industrial and commercial use. Unit consists of two 40 watt, 48 inch fluorescent lamps, ready to hang up and plug in any 60 cycle a.c. socket. Two different types of units are available, one for operation on 115 volts, the other on 230 volts. Overall length is 57 inches, width 9 inches and height 7 inches. Hygrade Sylvania Corp., Salem, Mass.



HYGRADE LIGHTING UNIT

Angle Adapter

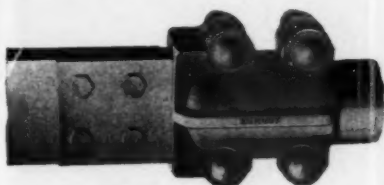
Adjustable angle adapter No. 4363 is designed for use with projector and reflector lamps. Lower half rotates 340 degrees. Flexible joint allows vertical adjustment up to 70 degrees from perpendicular, permitting a wide range of lamp direction. Adapter eliminates necessity of installing additional outlets as it can be inserted in any medium base lamp receptacle. Set screw is provided to hold flexible joint in desired position. Arrow-Hart & Hegeman Electric Co., Hartford, Conn.



ARROW-HART & HEGEMAN
ANGLE ADAPTER

Connector

This connector is designed to join laminated flat bars to tube or cable. Leaves in connector are cold-rolled copper bars solidly cast-in the copper alloy body, which guarantees high conductivity and accurate dimensions. Connectors of this Type FE have been furnished for all sizes of cable or tube to be joined to any size, spacing and number of flat bars. Burndy Engineering Co., Inc., 459 E. 133d St., New York.



BURNDY ELECTRICAL CONNECTOR

For Better Work and More Profits

Put GREENLEE Timesaving Tools on the Next Job

By using Greenlee Timesaving Tools for bending conduit, enlarging knockouts, pulling cable, pushing pipe, and other operations, much can be accomplished in the way of efficiency and much can be done to insure more profits. But that isn't all. In most cases it means that better work will be done on each job.

We know all these things to be true because so many users of Greenlee Tools have told us so. In fact many have told us that certain of these tools have more than paid for themselves on the very first job.



Cable Puller

This new tool has won the approval of all who have seen it in action. It clamps right to the conduit through which cable is to be pulled. Can be used in any position, is readily portable and has two operating speeds.



Hydraulic Conduit Benders

Greenlee Conduit and Pipe Benders are timesavers from the word go. Not only do they do the job in a hurry, but they make a smooth, even bend, and they save the cost of many manufactured fittings.

The rigid conduit bender, shown above, is made in two sizes for conduit from 1½ to 3-inch and from 3 to 4½-inch. The smaller bender can also be fitted with a set of attachments for bending 1½, 1½ and 2-inch thin-wall steel conduit.

Do You Have a Copy of Catalog No. 31-E?

This catalog illustrates and describes the Greenlee line of tools for electrical work, including all those listed in the coupon below. If you have a copy it will pay you to study these tools carefully. If not, ask for one now. You will find that it points the way to better work and more profits on every job.



GREENLEE TOOL CO.

Rockford, Illinois

Use this Coupon and Save Time

GREENLEE TOOL CO., ROCKFORD, ILL.

Please send information on the following tools:

☐ Conduit Benders ☐ Cable Puller ☐ Knockout Tools ☐ Radio Chassis Punches

☐ Joist Borer ☐ Electricians' Bits ☐ Bit Extensions ☐ Pipe Pushers

☐ Send Copy of Catalog 31-E

Name Address

City State

My Jobber is E.C. 10-29

No. 470 — Pipe or Conduit Hanger



Pipe support can be turned freely, permitting pipe to run parallel, or at right angles to beam. Eliminates drilling or use of straps. Will accommodate sizes of 1/4", 3/8" and 1" pipe to steel beams 1/2" thick.

FLOOR BOXES AND WIRING SPECIALTIES

No. 480 "BULLDOG" Armored Cable Support



A new, lightweight, strong clamp for supporting or hanging cable to steel framework. Permits hanging from any angle. Best and most economical way of temporarily or permanently installing armored cable in buildings of steel construction.

No. 252-R Two Gang Box




Two gang adjustable floor box with No. 208 receptacle in one section. One cover plate with 1/2" flush brass plug and the other cover with 2" flush brass plug.

The Latrobe Line is complete for all residential, commercial, and industrial requirements. In addition, the entire line is designed with the idea of reducing installation time... an important point to consider when selecting floor boxes and wiring specialties

FULLMAN MFG. CO.
LATROBE • PENNA.

DOUBLE OPPORTUNITIES
for
SALES AND PROFIT
SELLING AND INSTALLING



AUTOMATIC POULTRY TIME SWITCHES
for
LIGHTING POULTRY HOUSES

Cash in on this profitable market! Every poultry raiser now knows that **LIGHTS INCREASE PRODUCTION AND PROFIT**. They all want these Poultry Time Switches. Sell them! Install them! The season's short. **ACT NOW!**

FIVE MODELS
\$3.95 to \$18.00

With and without "Dimmer Circuit"
All-electric and Manually-wound.

Write for Information

AUTOMATIC ELECTRIC MFG. CO.
MANKATO, MINNESOTA

SEE FOR YOURSELF

How wires are wedged fast—gripped *completely around* in the **V-BOTTOM** wire opening of



ILSCO

SOLDERLESS LUGS

Learn how fast you can make strong, neat solderless connections . . . with just your wrench, screw driver or pliers.

SEE ONE IN ACTION!

Write for Free sample—or better still, ask your Electrical Jobber for one.

DEPT. E C
IlSCO Copper Tube & Products, Inc.
5629 Madison Road, Cincinnati, Ohio

EQUIPMENT News [FROM PAGE 91]

Motorpump

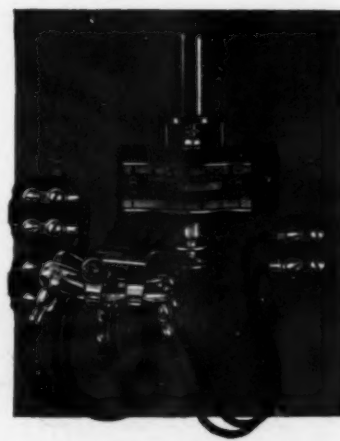
This motorpump is designed for all type of general service. Built in sizes for delivery of from 5 to 1000 gallons per minute and heads up to 500 feet. Pump impeller is mounted directly on shaft of electric-motor drive. Entire unit is enclosed in housing which requires no baseplate or foundation and may be bolted down for operation in any position. Ingersoll-Rand Company, 11 Broadway, New York, N. Y.



INGERSOLL-RAND PUMP

Relay

This mercury tube double throw relay is designed for transferring lighting loads from one source to another by operation from a remote control station or stations. For use as an automatic emergency changeover relay to transfer load from normal to emergency service and to automatically change back to normal service upon resumption of normal current supply. May be controlled by a manually operated single pole on and off switch, thermostat, time switch or other control device. Armature is equipped with a dash pot. Relay may be furnished mounted in flush or surface type metal box that fits standard panel board boxes. Coils may be furnished for operation on 115-225 volts, a.c. or d.c. or on special voltages. The Hart Manufacturing Co., Hartford, Conn.



HART DOUBLE THROW RELAY

Power Mica Undercutter

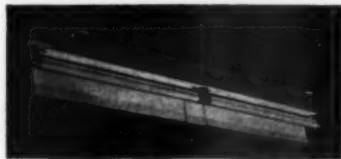
This shop type undercutter is designed for use on commutators that have been removed or on jobs where brush rigging has been removed. It consists of undercutter head, motor, flexible shaft and sheath. Head only is available for use with motor, shaft and sheath. Cuts to within 1/4-in. of commutator riser. Standard 1/2-in. saws or milling cutters with 1/8-in. holes are used. Air nozzle built into head keeps commutator free of dust. Ideal Commutator Dresser Co., 1041 Park Ave., Sycamore, Ill.



IDEAL UNDERCUTTER

Fluorescent Lighting Equipment

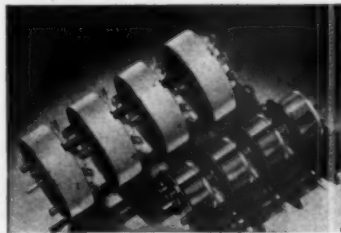
The knockout strip idea is now developed for fluorescent lumiline lamps, in wiring channel in which sockets, auxiliaries and capacitors and the trough reflector are installed. Its flexibility makes it possible to install either single lamps or runs of lamps in line to any length. Knockout strip No. KO-21 consists of two U-shaped members made of 20 gauge galvanized steel, finished in aluminum. Standard length of section is 9 feet 7 1/2 inches. Each section contains twenty knockouts and accommodates two sockets back to back. Pittsburgh Reflector Co., Oliver Bldg., Pittsburgh, Pa.



PITTSBURGH LIGHTING UNIT

Tandem Assemblies

These tandem assemblies are used to switch both sides of single-phase line or to switch all phases of a 3-phase line; to provide simultaneous control of separate circuits; and for other applications. The power tap switches used in these tandem mountings are multi-point, load-break, non-shortening, single-pole, and rotary selectors designed for a.c. use. Four sizes are available for single or tandem mountings. Ohmite Manufacturing Co., 4835 Flournoy St., Chicago, Ill.



OHMITE TANDEM ASSEMBLIES

*How to increase your **PROFIT** without increasing your costs!*

SELL SOUND AMPLIFYING EQUIPMENT — it's a "natural" for you

Today, the great majority of spots calling for electrical wiring also require Sound. You can handle this business, too! You can step up your profit on every job by recommending Clarion Sound equipment. It's packaged P.A. — ready for immediate installing, and hence, a "natural" for you!

In the past you have handled the electrical wiring, someone else the "sound." Why not save building owners time, trouble, money—and cut yourself in on some handsome extra profits without adding to overhead—install both the electrical work and the Public Address equipment yourself. Through the CISE plan—developed and proved by Transformer Corporation of America, world's largest exclusive manufacturer of sound equipment—you, the electrical contractor, can now capitalize on this extra business.

CISE

or Clarion Institute of Sound Engineers, is a "picked" group of qualified Clarion field agents. Membership in this organization is free. To the electrical contractor who qualifies for membership, CISE offers factory purchasing power, ship, CISE offers engineering and consulting service, installation, free engineering and consulting service—the perfect set-up to increase exclusive sales agency, free engineering and consulting service—the perfect set-up to increase business, profit and reputation.

As a competent electrical contractor, CISE throws open to you profitable business which you can handle efficiently and quickly—to the architect's satisfaction, to the building owner's advantage and to your own profit. Why neglect this opportunity?

ACT NOW!

The coupon below is your application for CISE membership. It will bring, in addition, complete information on the CISE, and the story of Clarion Quality sound equipment—1940's outstanding P.A. line. This in no way obligates you. Mail the coupon today!



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69 WOOSTER STREET
NEW YORK, N. Y.

Please send me an application form immediately. I want to belong. This, in no way obligates me.
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Address.....
City..... State.....

MOTOR REPAIR AND MAINTENANCE AIDS

Just what you're looking for—**IDEAL** Motor Maintenance Tools for keeping motors in "Tip-Top" condition.



IDEAL Resurfacers

maintain or restore smooth surfaces to Commutators and Slip Rings without disassembling motors. Types and sizes for every job; 8 grades from "extra coarse" to "polish."



Precision Grinders

restore smooth surface to neglected Commutators or Rings that are rough, out-of-round, badly burned or scored—without disassembling motors. Portable—mounts to motor frame—works while motor turns over in its own bearing.

IDEAL "Universal" Power Mica Undercutter



slot . . . spacing

Cuts quickly without vibration. Driven through flexible shaft. Three-way micrometer adjustment provided for depth of bars and variation in Commutator diameter. "Direct Drive" and "Shop Type" Undercutters also available.

WINDER'S TOOLS

IDEAL Winder's Tools—Slotting Tools, Armature and Coil Winding Heads, Coil Winding Drives, Tamping Tools, Wire Strippers, etc.

MODERN SOLDERING EQUIPMENT

IDEAL "Thermo-Grips," for every type of soft soldering job. Heat is concentrated where needed. Special heads to reach hard-to-get-at places. Safe—no torch—fuel tanks, etc. Use IDEAL Thermo-Grip Electric Soldering Tools for better and lower cost soldering.

PORTABLE CLEANERS



Away with dust, dirt, lint, bench litter—use IDEAL Portable Cleaners. Vacuum, Blow or Spray. IDEAL Cleaners blow only dry air. Powerful. High velocity low-pressure air stream efficiency! IDEAL Super-Powered "JUMBO" model (illustrated above) has full 1 H.P. motor! Ask for free trial demonstration!

MANY OTHER **IDEAL** MOTOR REPAIR AND MAINTENANCE AIDS—

"Wire-Nuts," Marking Equipment, Solder Lugs, Coil Winding Equipment, Commutator Saws and Milling Cutters, Growlers, Balancing Ways, Armature Winding Heads, complete line of Wire and Cable Strippers, etc.

Industrial Products Division

IDEAL COMMUTATOR DRESSER CO.

1041 Park Ave.

Sycamore, Illinois



[FROM PAGE 101]

Yardlight

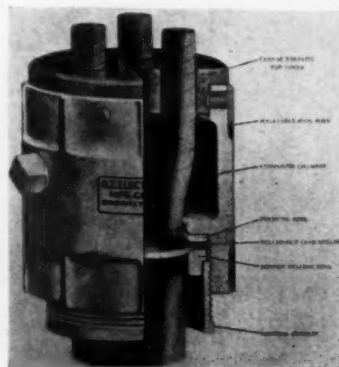
This new line of yardlights is available with weatherproof, enameled or porcelain enameled shallow dome reflectors, porcelain enameled standard dome and angle reflectors, all of the shade holder type. Can be obtained with either standard pole or wall fitting for open wiring, cast outlet box fitting or a new junction box fitting. Junction box fitting is a weather proof pole or wall mounting bracket outlet box, designed for conduit installations, without use of auxiliary fittings, or for service entrance cable with connectors. Both front and bottom outlets are threaded for 1/2-in. conduit or connector. Removable plate on side of box permits ready access to make splice at junction. Steber Manufacturing Co., 126 No. Union Ave., Chicago, Ill.



STEBER YARDLIGHT

Terminating Pothead

A terminating indoor type pothead for use on conduit or cable ends, to seal against moisture. For installing, bronze bell ring is passed over cable and set into end. Lead sheath is cut and belled over on flat surface of ring. Steel pressure ring goes over belled lead sheath. Malleable iron body is screwed directly on conduit and body is filled with compound. Canvas bakelite top cover is then passed over individual conductors, set into body, and secured by set screws. O. Z. Electrical Mfg. Co., Inc., 262 Bond St., Brooklyn, N. Y.



O. Z. TERMINATOR

The easiest way to get ahead in electricity—

through the other man's experience as found in books



Whatever "getting ahead" means to you as an individual, there is no principle so important as backing up your brain with the other man's experience. Why spend time and effort to find out what has already been learned and put down for all to see in books? Here, for instance, are all the results of a rich experience in every stage of wiring, installation and contracting work gathered and set down for you in

Terrell Croft's

AMERICAN ELECTRICIANS' LIBRARY

(6 volumes—over 2,000 pages—fully illustrated)

In six really magnificent volumes this library gives the most thorough, more complete and easiest-to-understand treatment of the more specialized phases of electrical practice in print today.

"How" and "why" for Maintenance Men

The books show the best ways to make installations for every type of conduit wiring job—they tell how to handle every kind of lighting and switch problem—they give tips on shortcuts for saving time on routine jobs—they show the quickest and surest methods of locating and remedying circuit troubles. Alternating current armature winding, electrical machinery control diagrams and machinery erection are some of the things covered in detail.

Diagrams

In all, these books contain more than 1,000 clear, easy to follow diagrams, with wiring instructions written in simple language. It is unnecessary to tell you how valuable is this one feature alone.

Small monthly payments

You may examine these books for 10 days by sending the coupon below, filled out. In addition, if you decide to keep the books you have the privilege of paying for them in easy monthly installments while you use the books. Make sure you are not passing up your best bet for getting ahead. Mail the coupon today.

EXAMINATION COUPON

McGraw-Hill Book Co., Inc.

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Send me Croft's American Electricians' Library, 6 volumes, for 10 days' free examination. If I find the books satisfactory, I will send you \$1.50 in 10 days, and \$2.00 a month until \$17.50 has been paid. Otherwise I will return the books postpaid.

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(Books sent on approval in U. S. and Canada only.)

Electrical Contracting, October 1939

Multi-Breaker

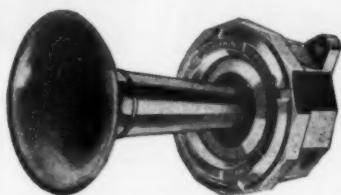
This new type "MO" multi-breaker is for home use. Will serve as a service center or a load center for lighting or appliances. Can be furnished to control either one or two circuits. On the farm, it assures over-current protection for feed grinders, milking machines, utility tools and all other equipment that can be operated by a small disconnecting switch. Box can be furnished with grounded neutral, insulated neutral or no neutral. Available for either surface or flush mounting. Designed for 15, 20, or 25 amperes. Colt's Patent Fire Arms Manufacturing Co., Hartford, Conn.



COLT'S
MULTI-BREAKER

Signal Tone

A new line of heavy-duty weatherproof and non-weatherproof howlers for industrial signal use. Entire assembly plugs into the base socket. Howler units being interchangeable, this "plug-in" feature assures line replacement being made with a minimum of signal service interruption. A threaded ring seals operating unit against dust and moisture. Non-weatherproof howlers have 1/4-inch knockouts for conduit entrance and mounting holders for attachment to standard outlet boxes. Both available in single and double projector models. Benjamin Electric Mfg. Co., Des Plaines, Ill.



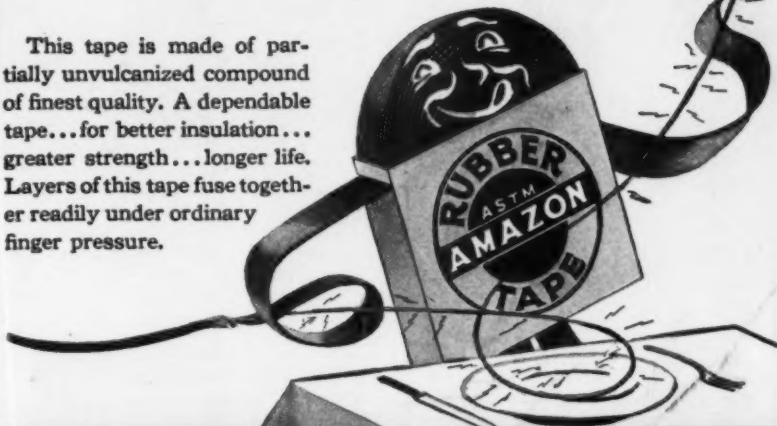
BENJAMIN INDUSTRIAL HOWLERS

Transformer Link

A protective link, connected between the bushing terminal and the winding of a transformer. These small links have high interrupting capacities. Several sizes are applicable to transformers from 2,400 to 66,000 volts. The links can be coordinated with other current disconnecting devices on the system and permit the transformer to carry peak overloads as well as automatically disconnect it from lines in case of internal trouble. Westinghouse Electric and Mfg. Co., East Pittsburgh.

"HOT 'JUICE' IS MY MEAT!"

This tape is made of partially unvulcanized compound of finest quality. A dependable tape...for better insulation...greater strength...longer life. Layers of this tape fuse together readily under ordinary finger pressure.



AMAZON-VICTOR
RUBBER TAPE
DISTRIBUTED BY
Graybar



OFFICES IN 83 PRINCIPAL CITIES. EXECUTIVE OFFICES: GRAYBAR BLDG., NEW YORK

Badger

Synchronous
ELECTRIC TIME
SWITCHES



CONTRACTORS LIKE THEM BECAUSE:

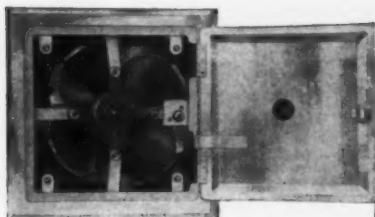
they are dependable and easy to install

USERS LIKE THEM BECAUSE:

of economical operation and low cost

The Badger line of Time Switches is always in demand by Contractors who want dependability, accuracy, and the right type for a specific need. They know from experience that this is the line that gives them successful, profitable installations. They know when they install Badger Synchronous Electric Time Switches for their customers they are giving them complete satisfaction—accurate timing, economical operation, dependable service. You can't go wrong on Badger. Write for more particulars or see your Wholesaler.

RELIANCE AUTOMATIC LIGHTING COMPANY
1937 MEAD STREET
RACINE, WISCONSIN



AUTOMATIC WALL BOX

Kitchen Vent Fan

- 10" Quiet Type Blades
- Totally Enclosed Motor
- Automatic, Weather-tight Shutters
- Telescopic Design for walls 7" to 24"
- Easy to Install
- Door Operated Switch
- Air Displacement 615 C.F.M. in free air
- List Price \$24.00 for 7" to 13" size
Slightly higher for 13" to 24" size

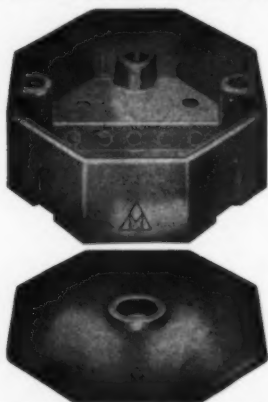
SIGNAL ELECTRIC MFG. CO.

Menominee, Michigan, U. S. A.

Offices in all principal cities

SIGNAL

Profit by USING **ILLINOIS** Dependable Porcelain **OUTLET BOXES**



* Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes, and mounting screws. High mechanical and electrical efficiency.

Contractors who use these products not only establish themselves most securely with their customers but also build their business by making each job a true quality one. Send for bulletin.

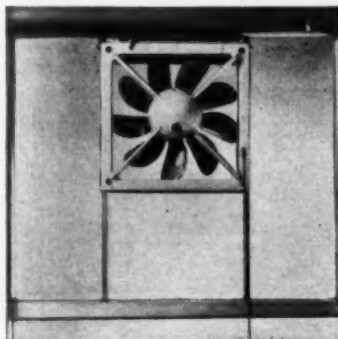
ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB, ILL.

EQUIPMENT *News*

[FROM PAGE 103]

Ventilator

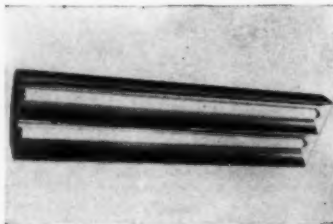
Ventrola is a home or office ventilator installed in the window pane. It has a steel enclosed glass louver. It can be installed in any type of window. Also built-in models are available for installation in either vertical or horizontal position. Pull chain opens louver and starts fan automatically; second pull on chain locks louver weathertight and stops fan. Finished in white porcelain, white enamel or polished finish with chrome plated fan blades. Fan is 10-inch, 9 bladed pressure-type. McLaughlin Ventilator Co., Ferndale, Mich.



McLAUGHLIN VENTROLA

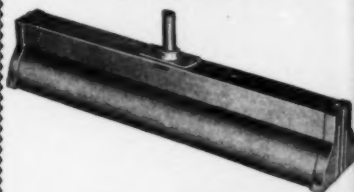
Fluorescent Luminaires

Fluorescent luminaires designed for general or supplementary industrial lighting applications. Both single and two-lamp units, for either 110-120 or 220-240-volts are available. Steel housing encloses reflectors, sockets and controls. Reflecting surface has a specular finish for the concentrating type two-lamp unit and a diffuse finish for the spread type single-lamp units. All housings, except on the 24-inch units, are provided with two-point suspension for attaching to one-half or three-fourths inch conduit. Hooks for chain suspension, safe-change hangers, or adjustable swivels for one-half inch conduit are available. Swivels are used where necessary to tilt fixtures. Knock-outs provided in both ends of each luminaire. Westinghouse Electric & Manufacturing Co., Cleveland.



WESTINGHOUSE LUMINAIRE

GET ACQUAINTED WITH **MULTI** FLUORESCENT LAMPS and GOOD BUSINESS



There's going to be a demand for true daylight lamps in the coming months—get a good start and find out about Multi Fluorescent Lamps NOW. Each reflector is especially designed and has special construction features which give best lighting results and make them serve efficiently over long periods of time. Units are of aluminum bronze finish—reflectors of alscoc aluminum. Many combinations can be worked out from the basic unit shown. Let us send you construction and installation details.

MULTI
ELECTRICAL MANUFACTURING CO.
1840 W. 14th ST., CHICAGO, ILL.

BUYING HELP WANTED

No need for this sign
when you have an
**ELECTRICAL BUYERS
REFERENCE**

Containing complete information
on electrical and allied products

Use your copy regularly
to save time and money!

ELECTRICAL CONTRACTING
330 West 42nd Street, New York

Manual Starter

A new Type "TT" auxiliary breaker to provide control and overload protection for a.c. or d.c. motors of 1 hp. or less, through thermostatic action has recently been developed. Available in both single and double pole and provides quick make and quick break of contacts which are silvered. Trumbull Electric Mfg. Co., Plainville, Conn.

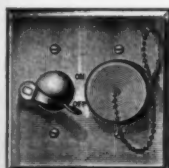


TRUMBULL TYPE

"TT" STARTER

Switch and Receptacle

Advantages of outdoor weatherproof switch control and flush receptacles are combined in this new two-gang unit. Complete with switch, receptacle, cadmium finished brass plate and rubber mat. Available in single pole, double pole, three or four way switch. Receptacle is bakelite. When receptacle is not in use, metal cap screws over opening, protecting it from rain or hose cleaning. Arrow-Hart & Hegeman Electric Co., Hartford, Conn.



ARROW-HART

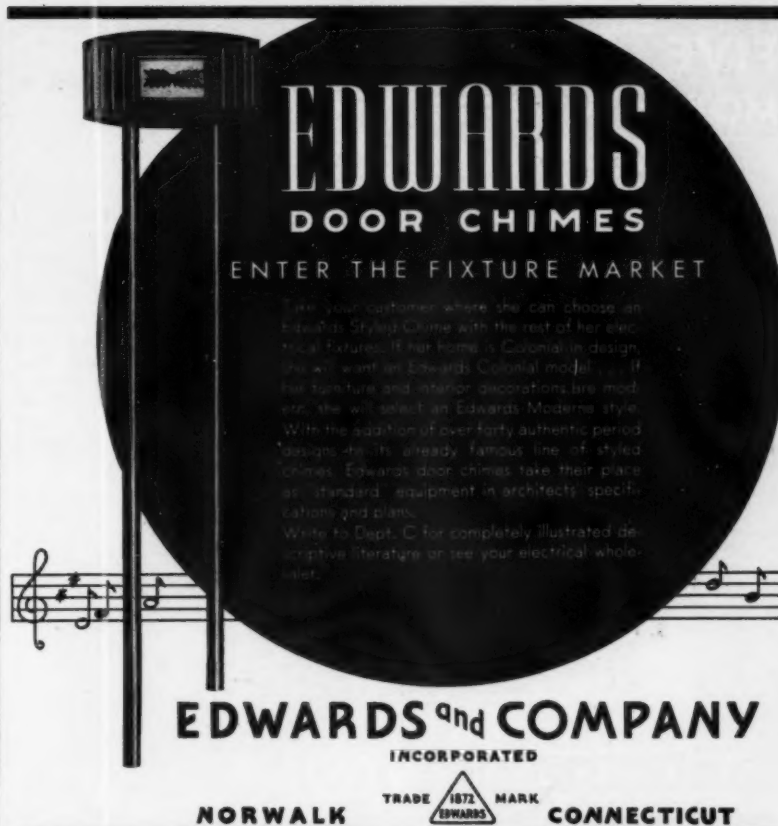
& HEGEMAN SWITCHES

Attachment Plug

A new line of C&E safety attachment plugs known as Series No. 15. Held in an unbreakable hard rubber insert, which fits into a rubber jacket having a flexible shank. Has a special oil and grease resisting flexible baked lacquer finish. Cord grip clamp removes all tension from connections. Made in 15 amp., 125 volts and 10 amp., 250 volts. The Ericson Manufacturing Co., 5716 Euclid Ave., Cleveland, Ohio.



ERICSON ATTACHMENT PLUG



EDWARDS

DOOR CHIMES

ENTER THE FIXTURE MARKET

Take your customer where she can choose an Edwards Styled Chime with the rest of her electrical fixtures. If her home is Colonial in design, she will want an Edwards Colonial model. If her furniture and interior decorations are modern, she will select an Edwards Modern style. With the addition of over forty authentic period designs to the already famous line of styled chimes, Edwards door chimes take their place as standard equipment in architects' specifications and plans.

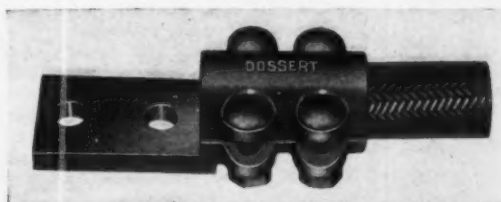
Write to Dept. C for completely illustrated descriptive literature or see your electrical wholesaler.

EDWARDS and COMPANY

INCORPORATED

NORWALK TRADE MARK 1872 EDWARDS MARK CONNECTICUT

The *NEW* Line of DOSSERT BOLT CONNECTORS



TERMINAL
TYPE
KDFL

Dossert Bolt Connectors reduce installation costs. Contact surfaces are machined for absolute dependability; withstand overloads, vibrations and short circuits. Palnuts are standard with all "KD" types. Operating temperature kept well within A.I.E.E. limits. Ampere capacity equals that of extra heavy iron pipe size copper tubing.

"Where your wires, tubes or cables come together, connect 'em with Genuine 'Dosserts' the Original Solderless Connectors for Electrical Conductors"

Just Out!
Catalog #40

Shows the complete new line of Dossert Connectors. Send for your copy TODAY!

DOSSERT & COMPANY
242-244 W. 41st St., N.Y.C.

Please send me a copy of Catalog #40

(Name)

(Address)

FIVE "IDEAL" MONEY MAKERS

1. Wire Nuts

"Solderless — tapeless Wire Connectors." Skin wires — Screw On — That's All! One size for all common wiring joints. Fully Approved — Listed by Underwriters' Laboratories, Inc. MILLIONS IN USE!

2. "E-Z" Wire Strippers

Strip the toughest insulation without nicking or cutting strands. Models and sizes for stripping solid or stranded wires from No. 30 gauge to No. 5.

3. Cable Ripper

For ripping non-metallic sheathed duplex cable or lead covered cable. Cuts cleanly — easily — quickly.

4. Joist Boring Machine

Ends tiresome and dangerous reaching. Bore holes at any angle — reaches to 11 ft. height above floor, bores beneath floor.

5. Fish Tape, Reel & Puller

NOW fishing IS a pleasure! You get three tools in one — Fish Tape, Reel and Puller. Keeps tape reeled up — no expensive tape breakage — no "live" contacts. NEW! "Junior No. 0" — Price \$2.50. Easily fits in tool kit.

SOLD THROUGH JOBBERS

Electrical Products Division
Ideal Commutator Dresser Company
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EQUIPMENT News

[FROM PAGE 105]

Searchlight

A simplified incandescent searchlight for long-range spot floodlighting. Designed for 1000-watt or 1500-watt spotlight or floodlight lamps, it gives about a 10-degree beam spread. Alzak-finished aluminum reflector, aided by an auxiliary reflector, builds up beam efficiency and redirects stray light. Tilting support for auxiliary reflector simplifies relamping and four hand-operated clamps secure heat-resisting glass door, which is mounted in cast-aluminum ring. It is equipped with 6 feet of 2-conductor, No. 12 cable. General Electric Co., Schenectady, N. Y.



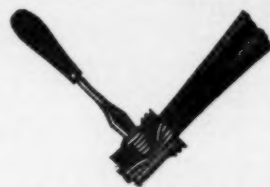
G-E SEARCHLIGHT

Lighting Fixture

This dust-proof fixture is for use in flour and feed mills, grain elevators, coal pulverizing plants. Has heavy threaded clear glass globe, one-piece copper hood, which may be fitted with heat-resisting daylight blue, ruby or diffusing globes. Approved by Underwriters' Laboratory for use in Class II, Group G, hazardous locations, where combustible dust is suspended in air in sufficient quantities to produce explosive mixtures. Also in Class III and Class IV locations where fibers and materials producing combustible particle are manufactured, handled or stored. Fixture is dustproof, moisture-proof and weather-proof. Accommodates lamp sizes from 25 to 150 watts. Goodrich Electric Co., 2900 N. Oakley Ave., Chicago, Ill.



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Tests Everything Electrical
From 100 to 550 Volts

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L. S. BRACH
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57 Dickerson St., Newark, N. J.

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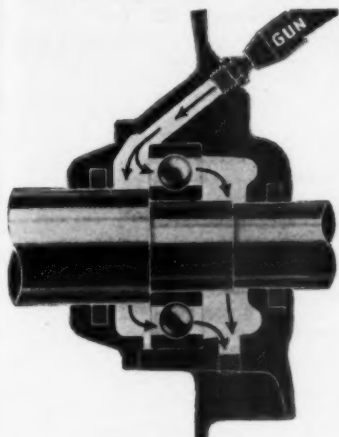
SIGNCRAFT

Charles City

Iowa

Lubricating System

The Lubriflush system of lubricating motor bearings has been developed. Through a duct leading from outside of motor, new lubricant is injected to inner side of bearing with a pressure gun. A drain is placed on opposite side of bearing underneath. As new lubricant is injected, old is forced out of bearing and before new lubricant reaches drain exit, it must first flush entire bearing and chamber. U. S. Electrical Motors, Inc., Los Angeles, Calif.



U. S. LUBRIFLUSH

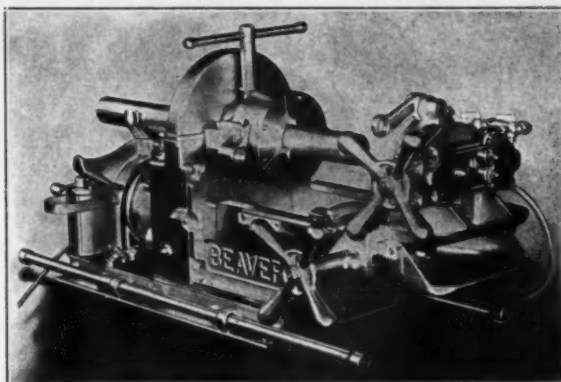
Industrial Lighting Units

Two new industrial concentrator lighting units for horizontal and vertical surfaces from an oblique angle have been designed for use in fine assembly work, inspection, spray booths, machine work or paint shops. Unit consists of aluminum reflector, porcelain socket assembly, aluminum socket housing and swivel-mounting bracket for one-half-inch conduit mounting. Employs a one-piece reflector with diffuse or specular reflecting surface. Have heat-resisting glass lenses. Smaller size uses 200-watt clear or inside frosted bulb and larger unit uses 300- or 500-watt clear lamps. Westinghouse Electric & Mfg. Co., Cleveland, Ohio.



WESTINGHOUSE LIGHTING UNIT

Electrical Contracting, October 1939



The New HIGH SPEED Beaver Model-A

Will out-perform any competitive machine in speed, performance and convenience!
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*See 1938-1939 Buyers' Reference number of Electrical Contracting for additional information on these companies and their products.

A Cost Comparison

SQUARE D MULTI-BREAKER

VS SWITCH AND FUSES



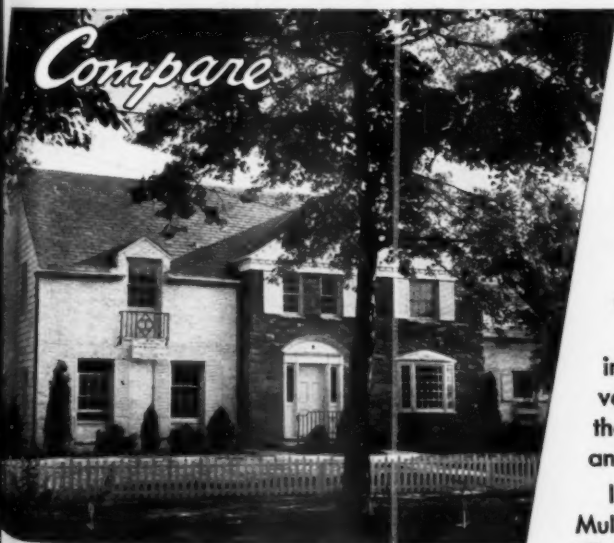
Assume this cottage requires 2 branch circuits for lighting and appliances. Compare these costs.

Dead front switch with fuses \$2⁹⁰
■ MULTI-BREAKER \$2⁶⁵



This size house probably will require 6 circuits, 3 for lighting and 1 each for appliances, range and water heater.

Cost of service distribution center with fuses \$16⁰⁰
■ MULTI-BREAKER \$13⁵⁰



A house of this size probably will require 5 lighting circuits, 1 appliance circuit, 1 range circuit and 1 separately metered water heater circuit.

Cost of service distribution center with fuses \$18⁶⁰
■ MULTI-BREAKERS \$21⁹⁰

(Photo courtesy Wychwood Corp., Wychwood, Westfield, N. J.)

● If you think Square D Multi-breakers add to the cost of house wiring, read the comparative figures. Sometimes they cost less—sometimes a little more—but the difference is always negligible.

And look what you offer the home builder! Circuit breaker protection—branch circuit switching—no fuses with the expense and nuisance of replacing them!

Here is the kind of ammunition that gives you a real advantage over your "switch and fuse" competitors.

One other important point—the Multi-breaker interests the home builder in better wiring, more convenience outlets, more electrical appliances. It lays the foundation for a bigger and better wiring job and more profits for you.

If you haven't the complete story of the Square D Multi-breaker, get in touch with your Square D distributor or write for Bulletin CA-543.

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Install G-E Home Wiring* in every home you wire. You will be doing a favor for your customers and yourself. Your customers will obtain truly adequate wiring. You will obtain larger wiring jobs. The use of G-E wiring materials enhances your reputation for dependable work because G-E materials give lasting, satisfactory service. For a G-E Home Wiring* manual and for further information on G-E wiring materials see the nearest G-E Merchandise Distributor or write to Section CDW-9410, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

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